TOGITO"56659260

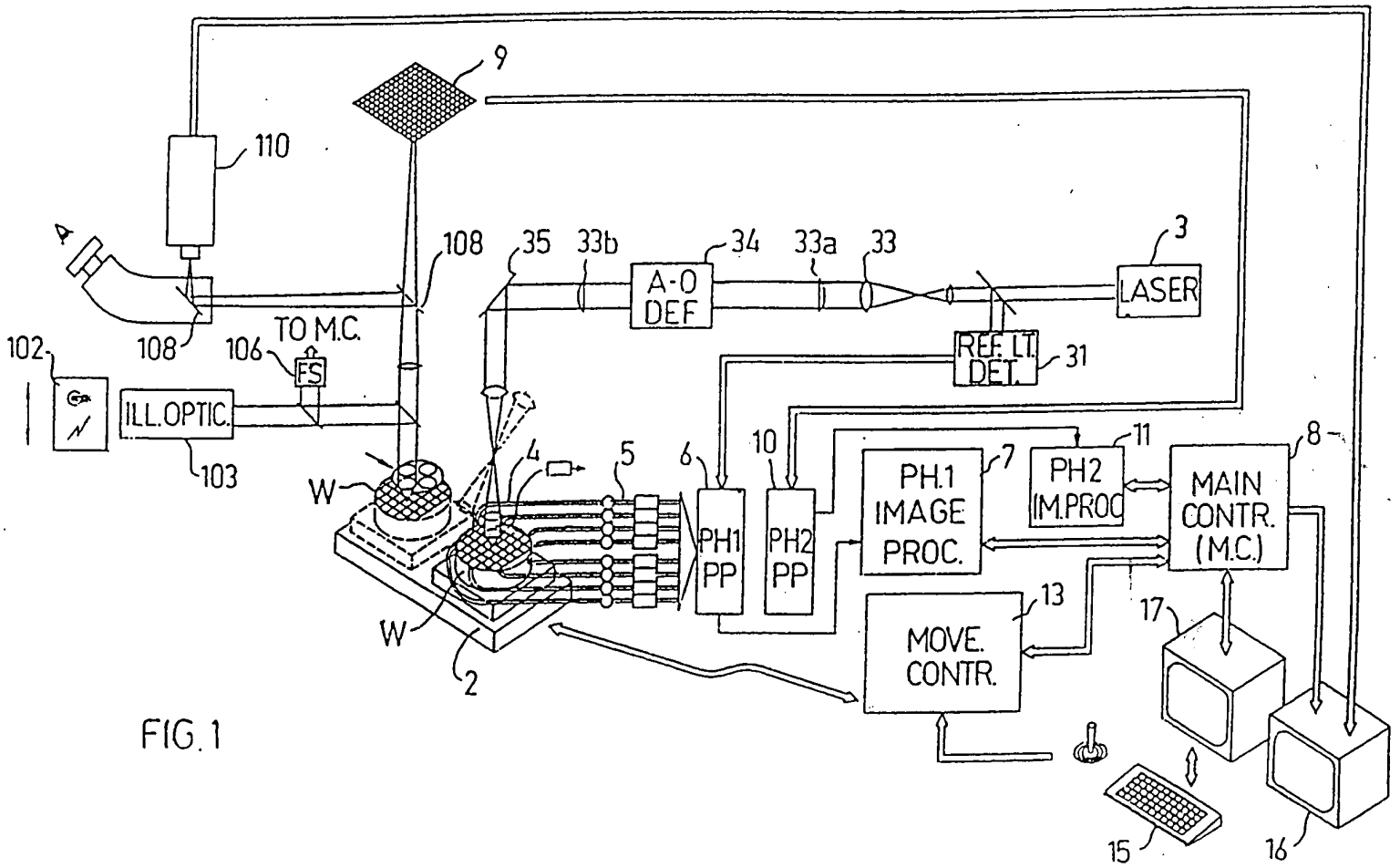


FIG. 1

TOETTO" 56599260

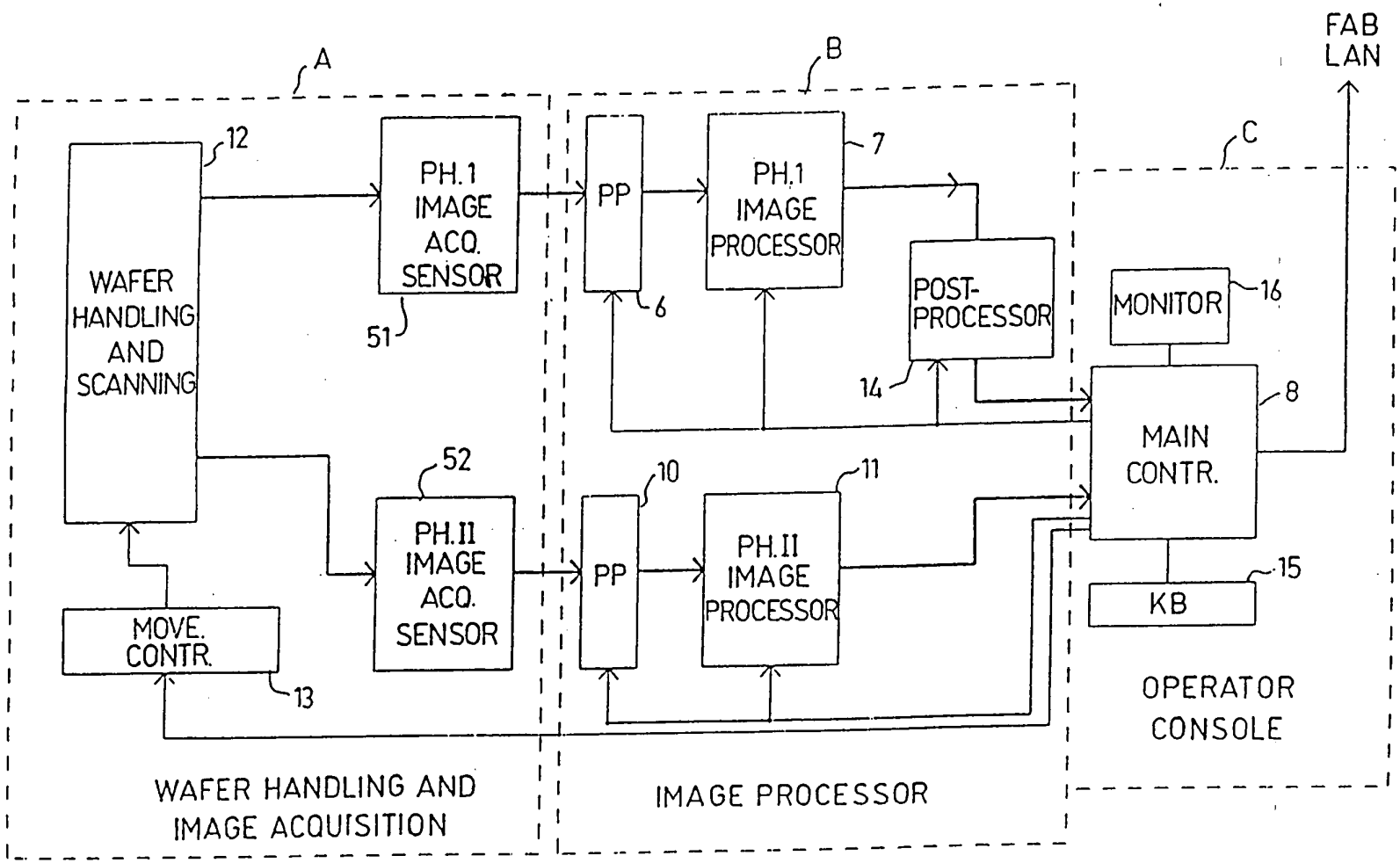


FIG. 2

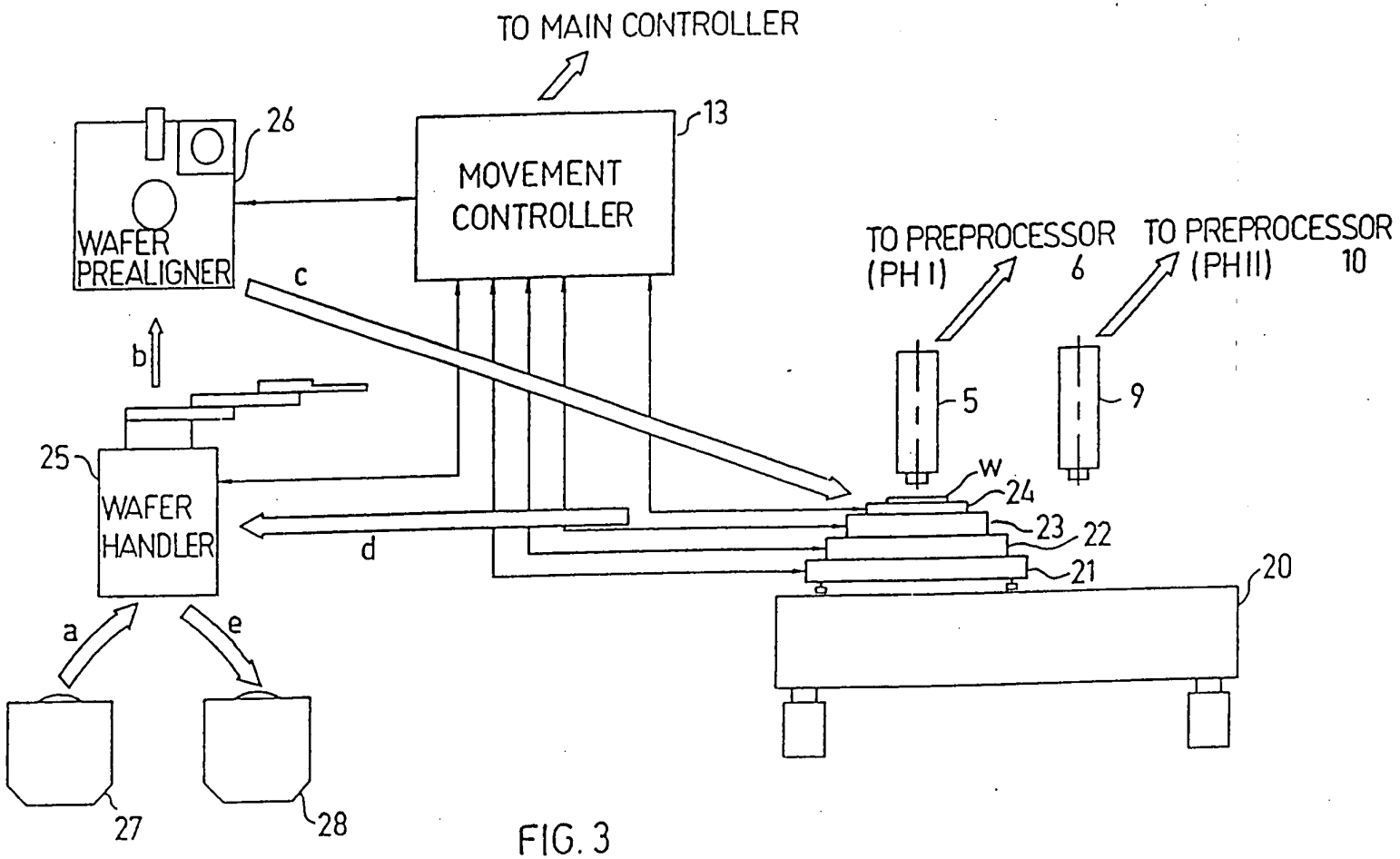
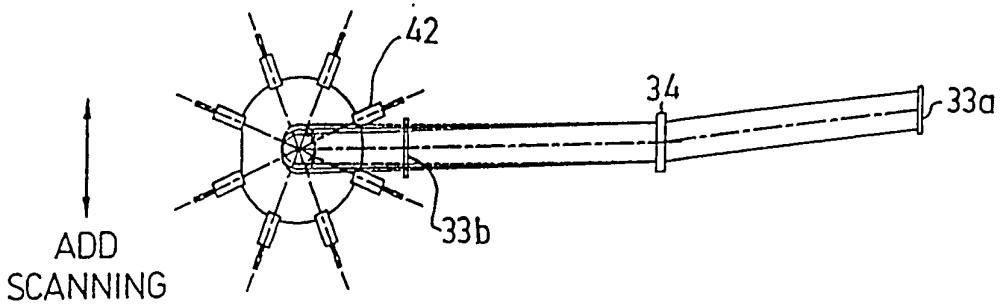

TO MAIN CONTROLLER
26
13
MOVEMENT CONTROLLER
WAFER PREALIGNER
c
TO PREPROCESSOR (PH I) 6
TO PREPROCESSOR (PH II) 10
b
5
9
25
WAFER HANDLER
W
24
23
22
d
21
20
a
e
27
28

FIG. 3

FIG . 5


42
34
33a
33b
ADD
SCANNING
DIRECTION

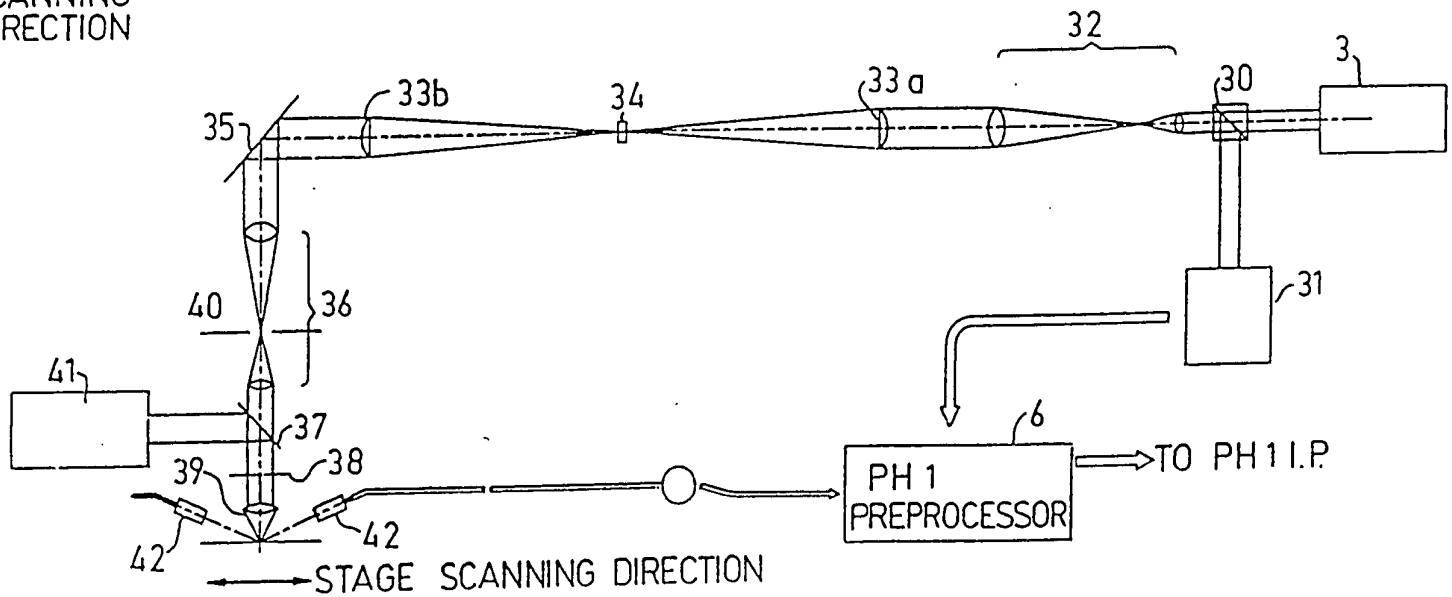

32
3
33b
34
33 a
30
35
40
36
31
41
37
6
39
38
PH 1
PREPROCESSOR
TO PH 1 I.P
42
42
STAGE SCANNING DIRECTION

FIG . 4

FIG . 6

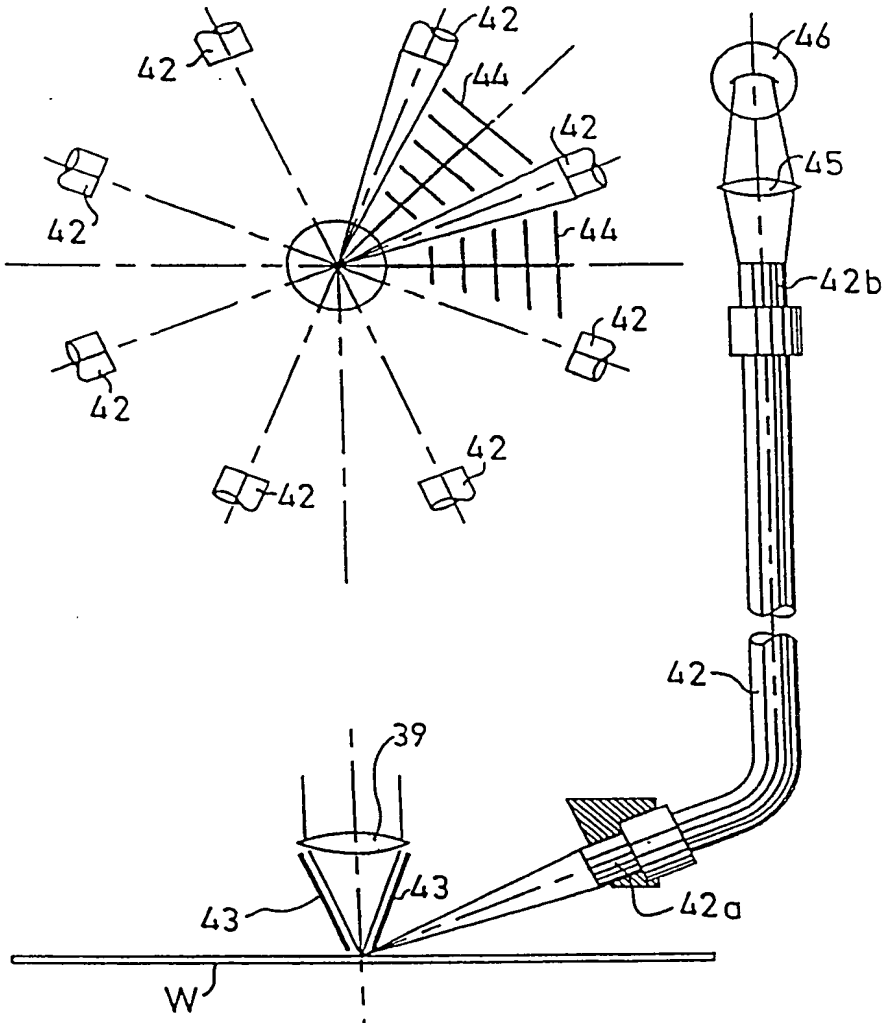


FIG . 7

EP 0 571 960 A1

FIG . 6a

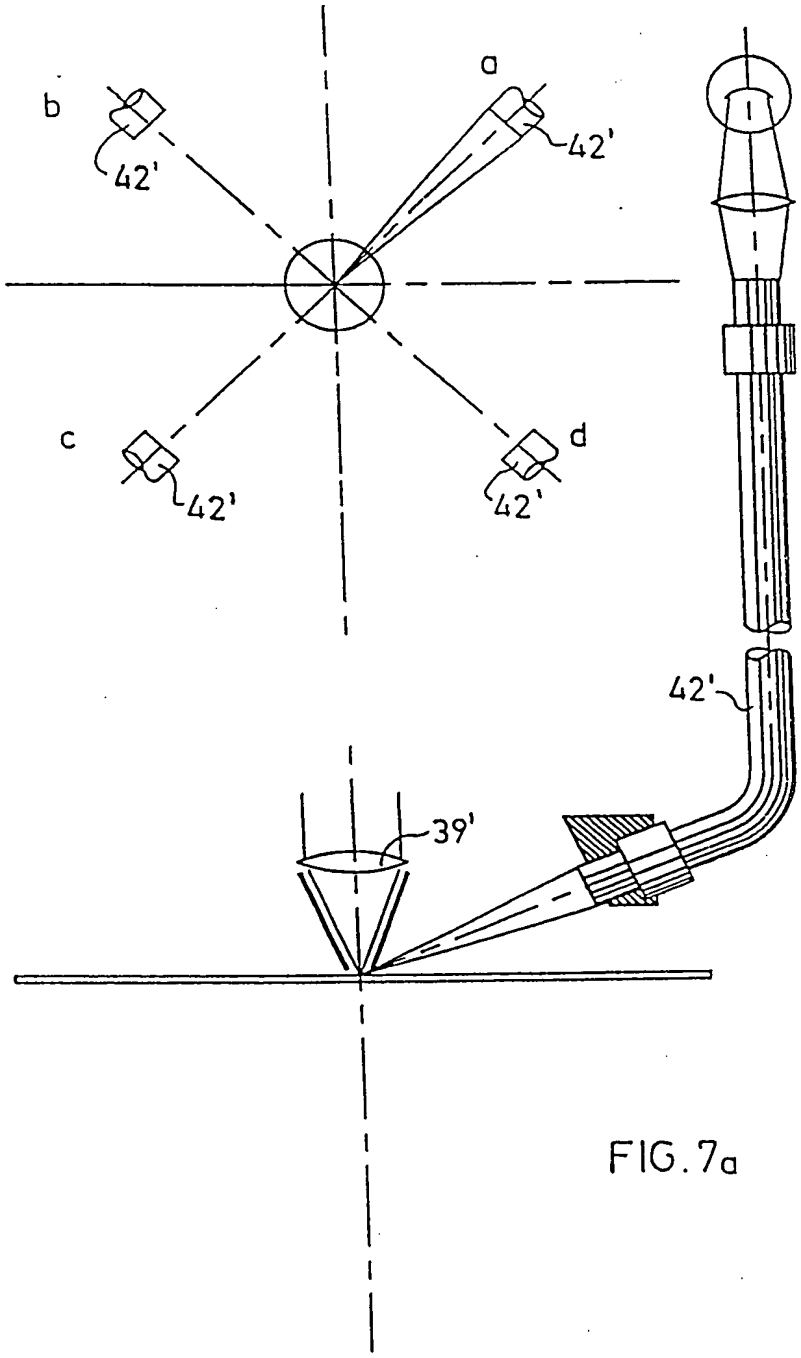


FIG. 7a

EP 0 714 750 A1

09765995 - 011904

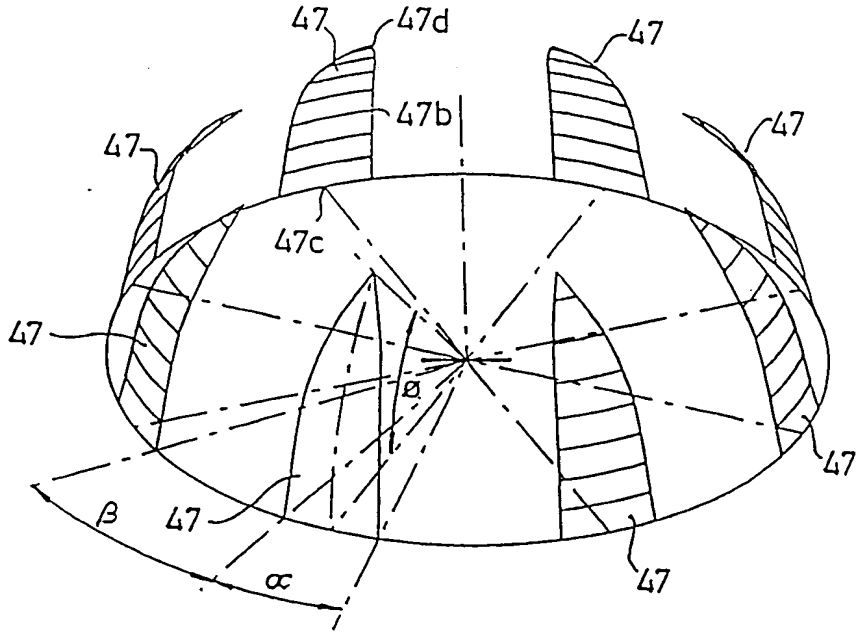


FIG 8

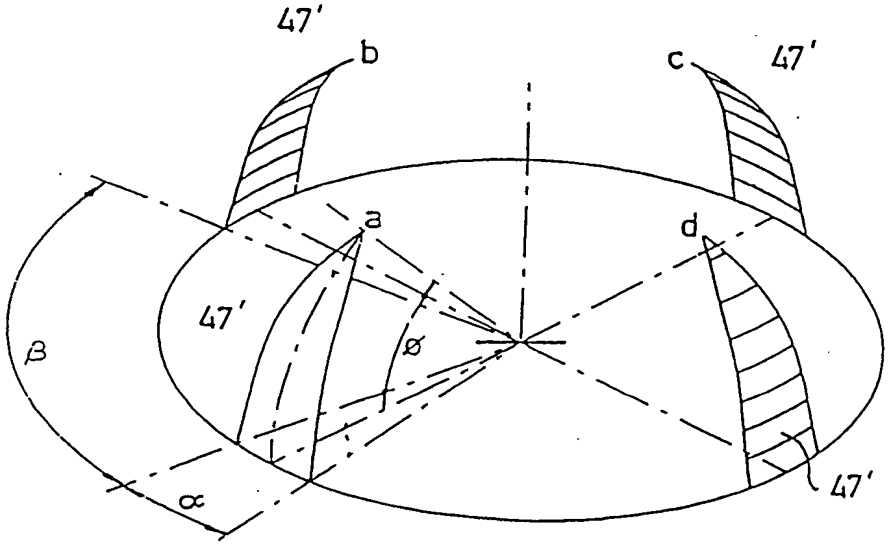


FIG 8a

EP 0 656 556 A2

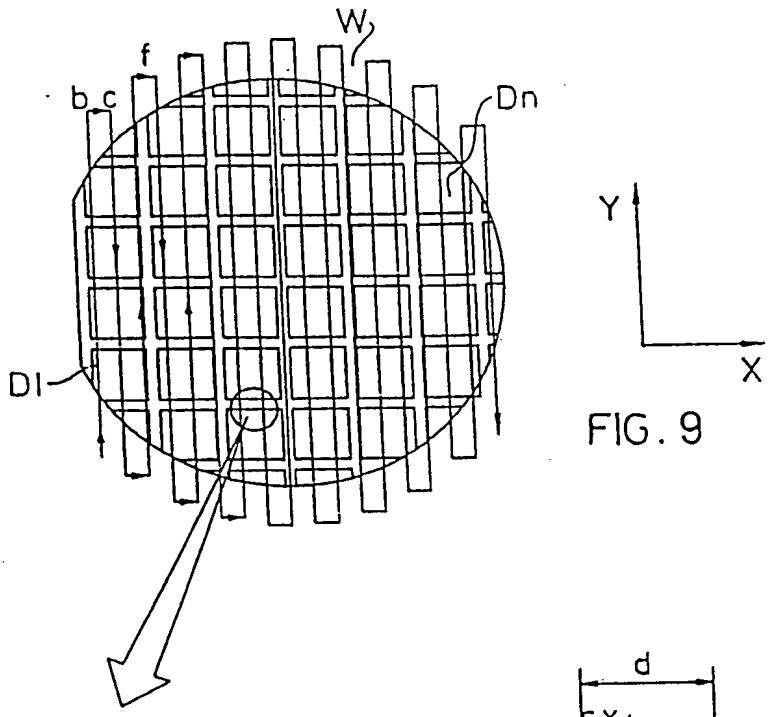


FIG. 9

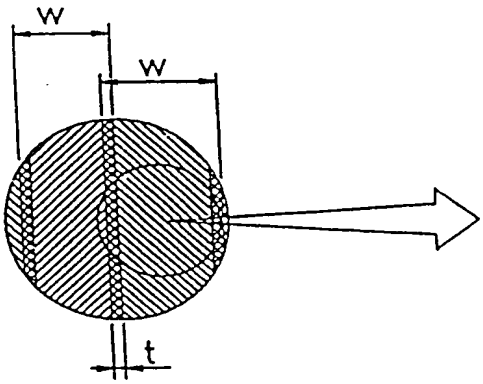


FIG. 10

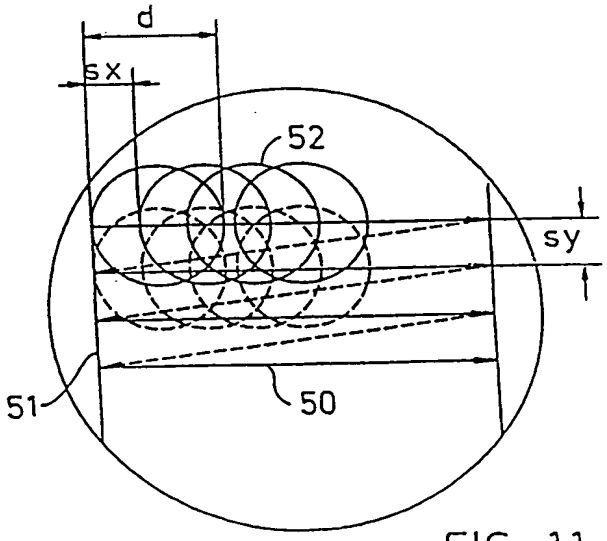


FIG. 11

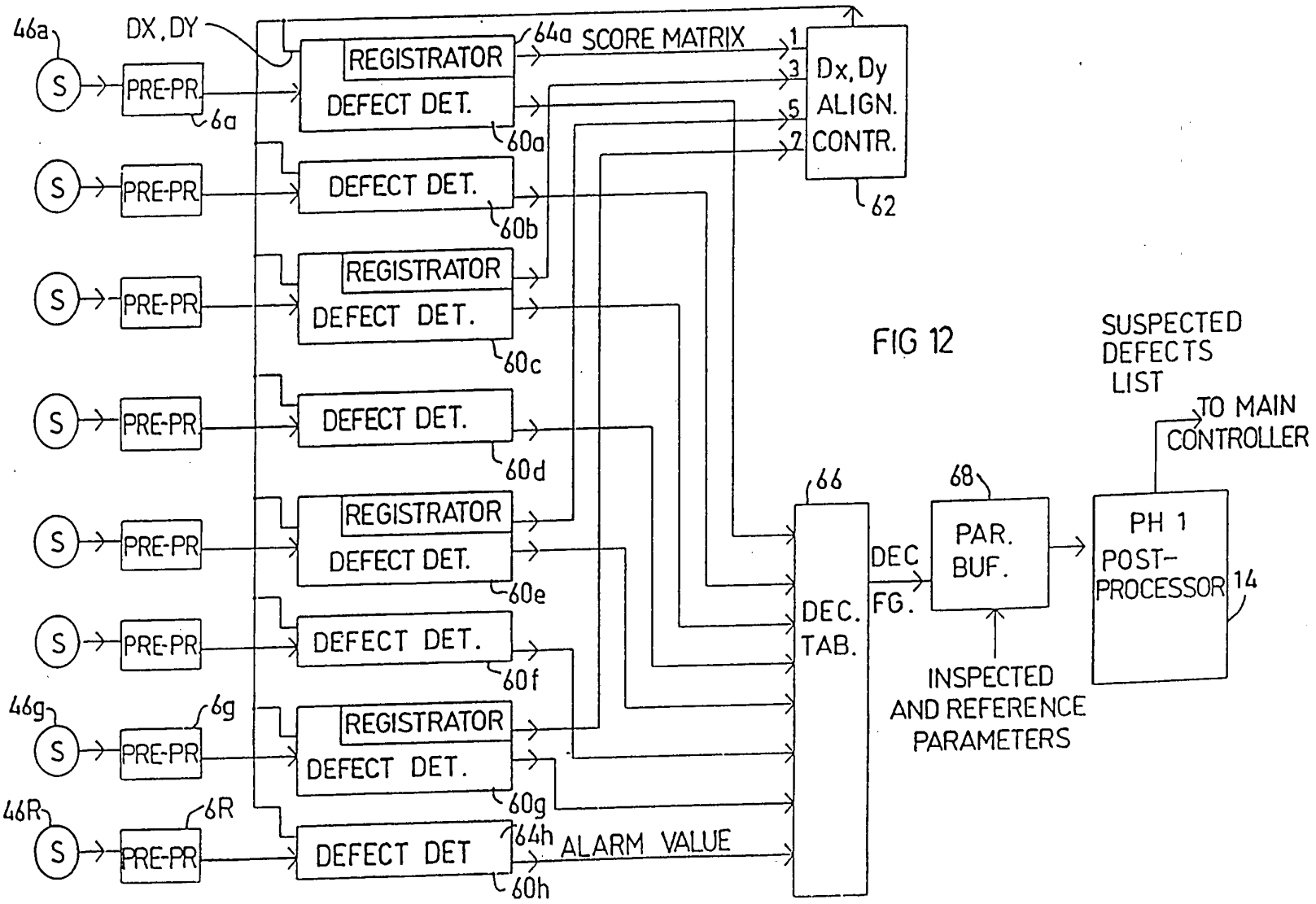

46a
DX, DY
S
PRE-PR
6a
REGISTRATOR
DEFECT DET.
60a
64a SCORE MATRIX
1
3
5
7
Dx, Dy
ALIGN.
CONTR.
62
DEFECT DET.
60b
REGISTRATOR
DEFECT DET.
60c
DEFECT DET.
60d
REGISTRATOR
DEFECT DET.
60e
DEFECT DET.
60f
46g
6g
REGISTRATOR
DEFECT DET.
60g
46R
6R
DEFECT DET
64h
ALARM VALUE
60h
66
DEC.
TAB.
DEC
FG.
68
PAR.
BUF.
INSPECTED
AND REFERENCE
PARAMETERS
PH 1
POST-
PROCESSOR
14
SUSPECTED
DEFECTS
LIST
TO MAIN
CONTROLLER

FIG 12

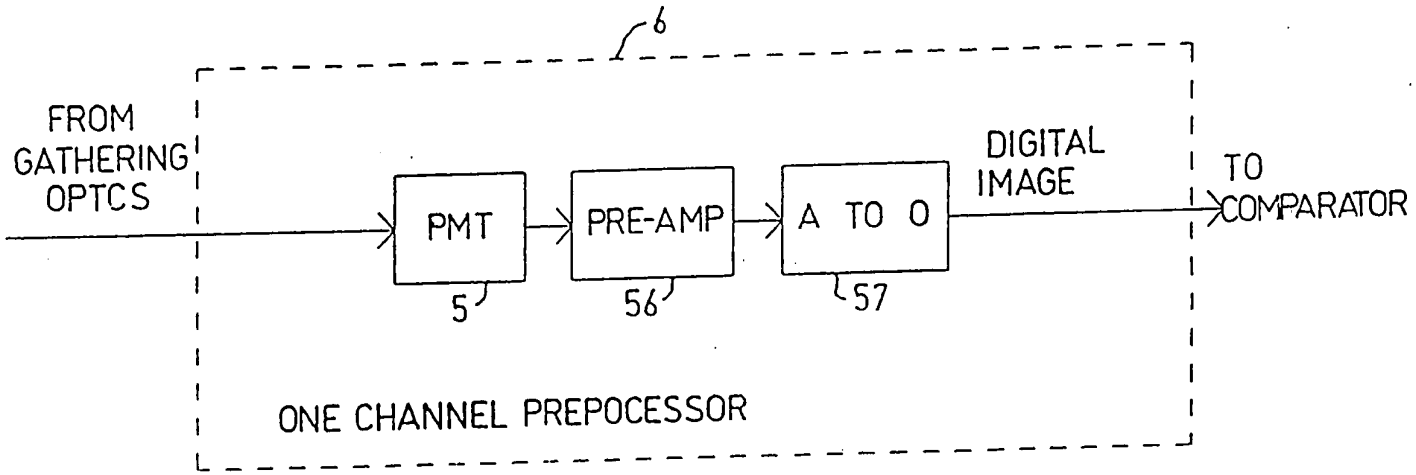

6
FROM GATHERING OPTCS
PMT
PRE-AMP
A TO O
DIGITAL IMAGE
TO COMPARATOR
5
56
57
ONE CHANNEL PREPOCESSOR

FIG . 13

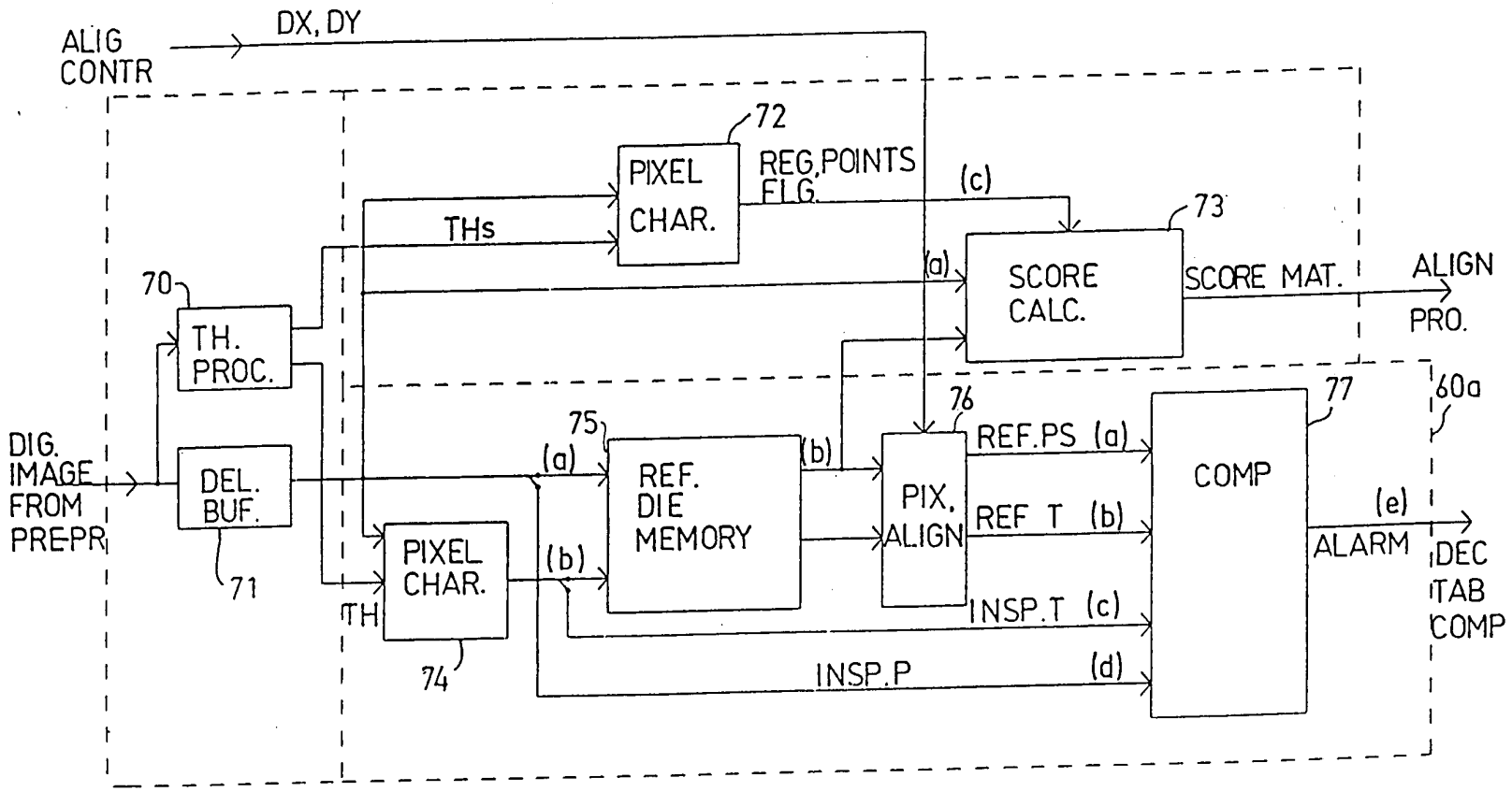

ALIG CONTR
DX, DY
72
PIXEL CHAR.
REG.POINTS FLG.
(c)
73
THs
(a)
SCORE CALC.
SCORE MAT.
ALIGN PRO.
70
TH. PROC.
DIG. IMAGE FROM PRE-PR
DEL. BUF.
71
75
(a)
REF. DIE MEMORY
(b)
76
PIX. ALIGN
REF.PS (a)
REF T (b)
INSP.T (c)
INSP.P
(d)
COMP
77
(e)
ALARM
60a
DEC TAB COMP
PIXEL CHAR.
(b)
TH
74

FIG . 14

EP 0 670 560 A2

FIG 14a

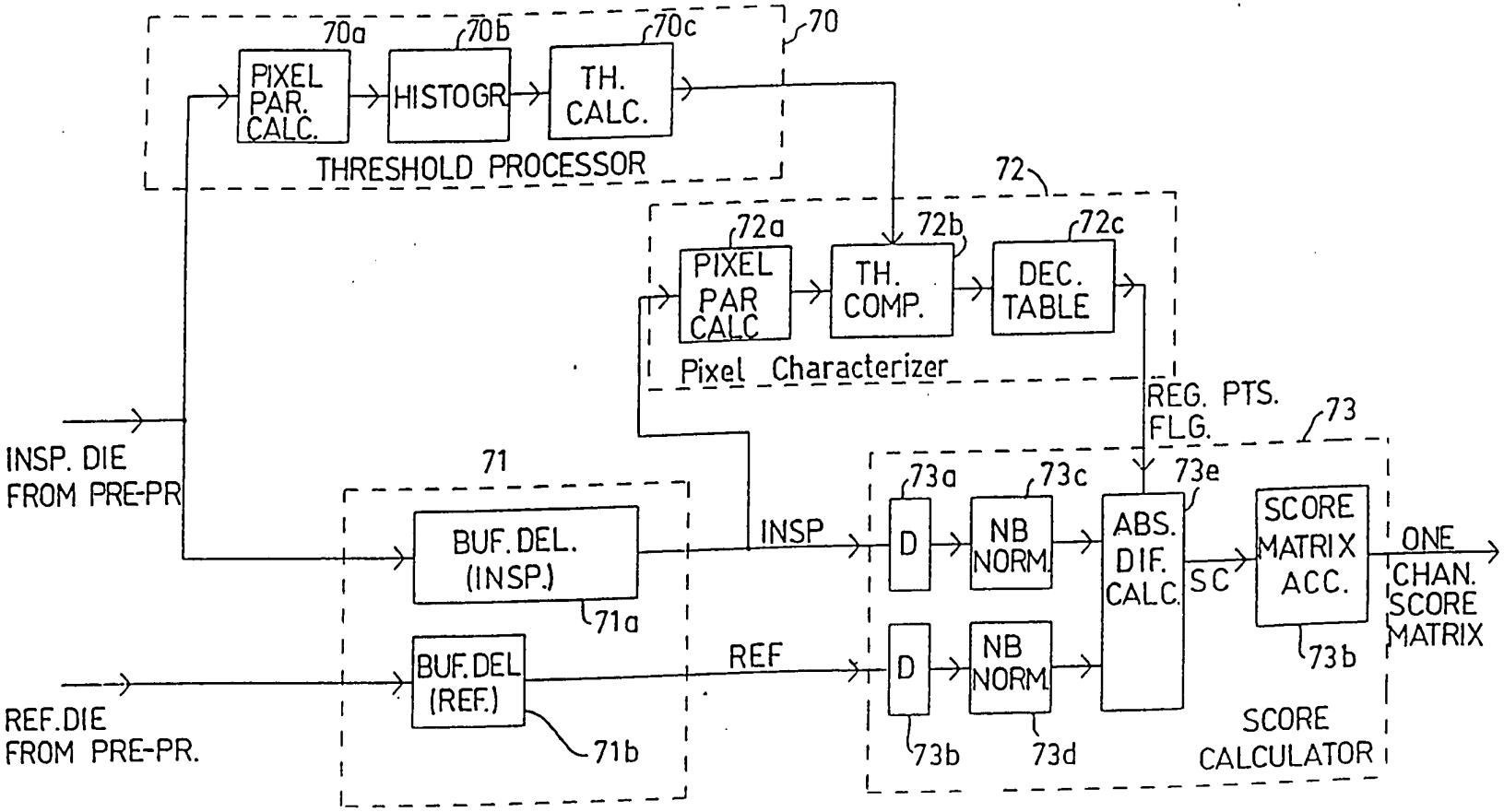

70
70a
70b
70c
PIXEL PAR. CALC.
HISTOGR
TH. CALC.
THRESHOLD PROCESSOR
72
72a
72b
72c
PIXEL PAR CALC
TH. COMP.
DEC. TABLE
Pixel Characterizer
REG. PTS. FLG.
73
INSP. DIE FROM PRE-PR
71
BUF. DEL. (INSP.)
71a
INSP
73a
73c
73e
D
NB NORM
ABS. DIF. CALC.
SC
SCORE MATRIX ACC.
ONE CHAN. SCORE MATRIX
73b
BUF. DEL (REF.)
71b
REF
D
NB NORM
73b
73d
REF. DIE FROM PRE-PR.
SCORE CALCULATOR

FIG . 15

T06TTO'56659260

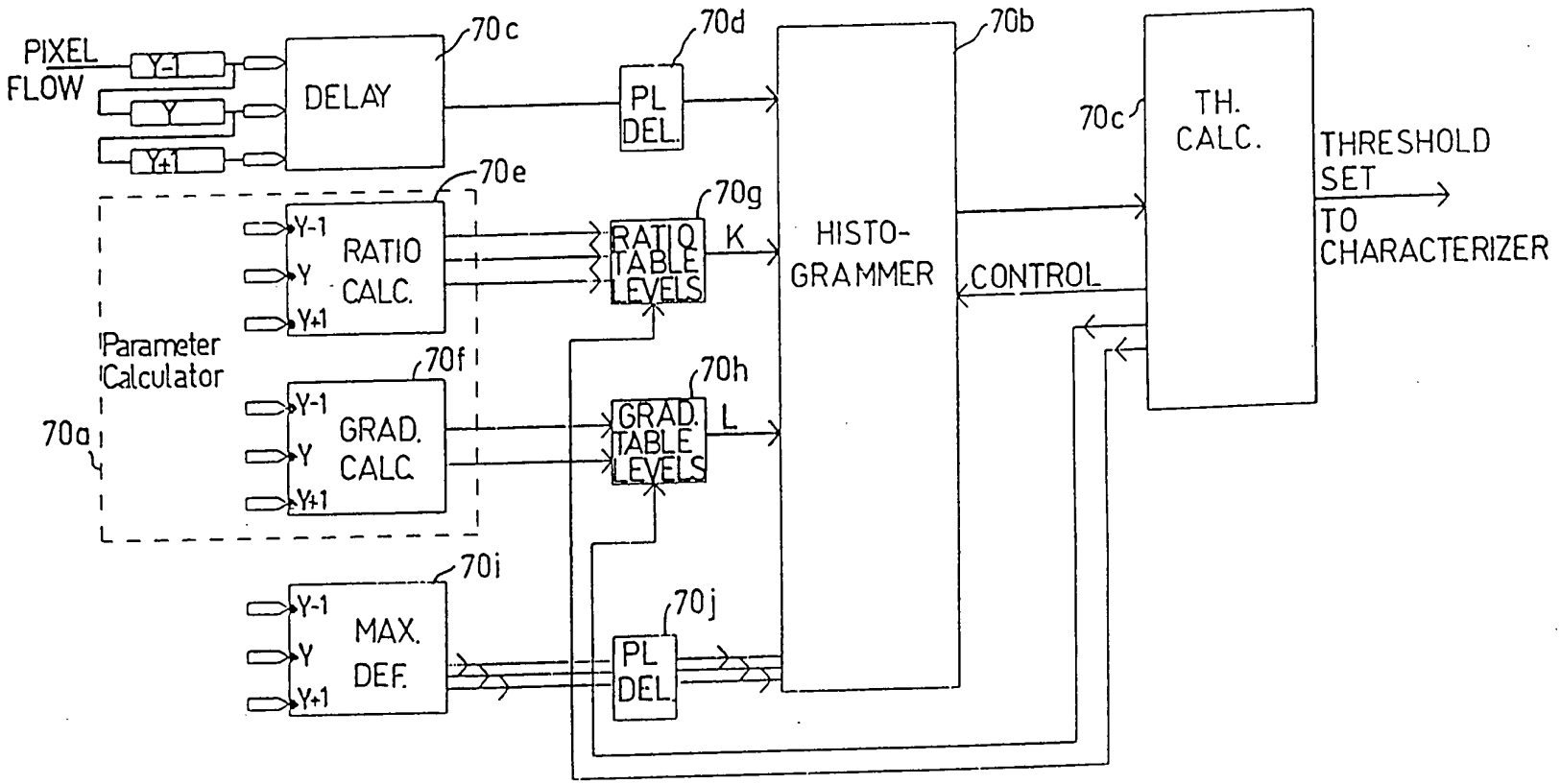
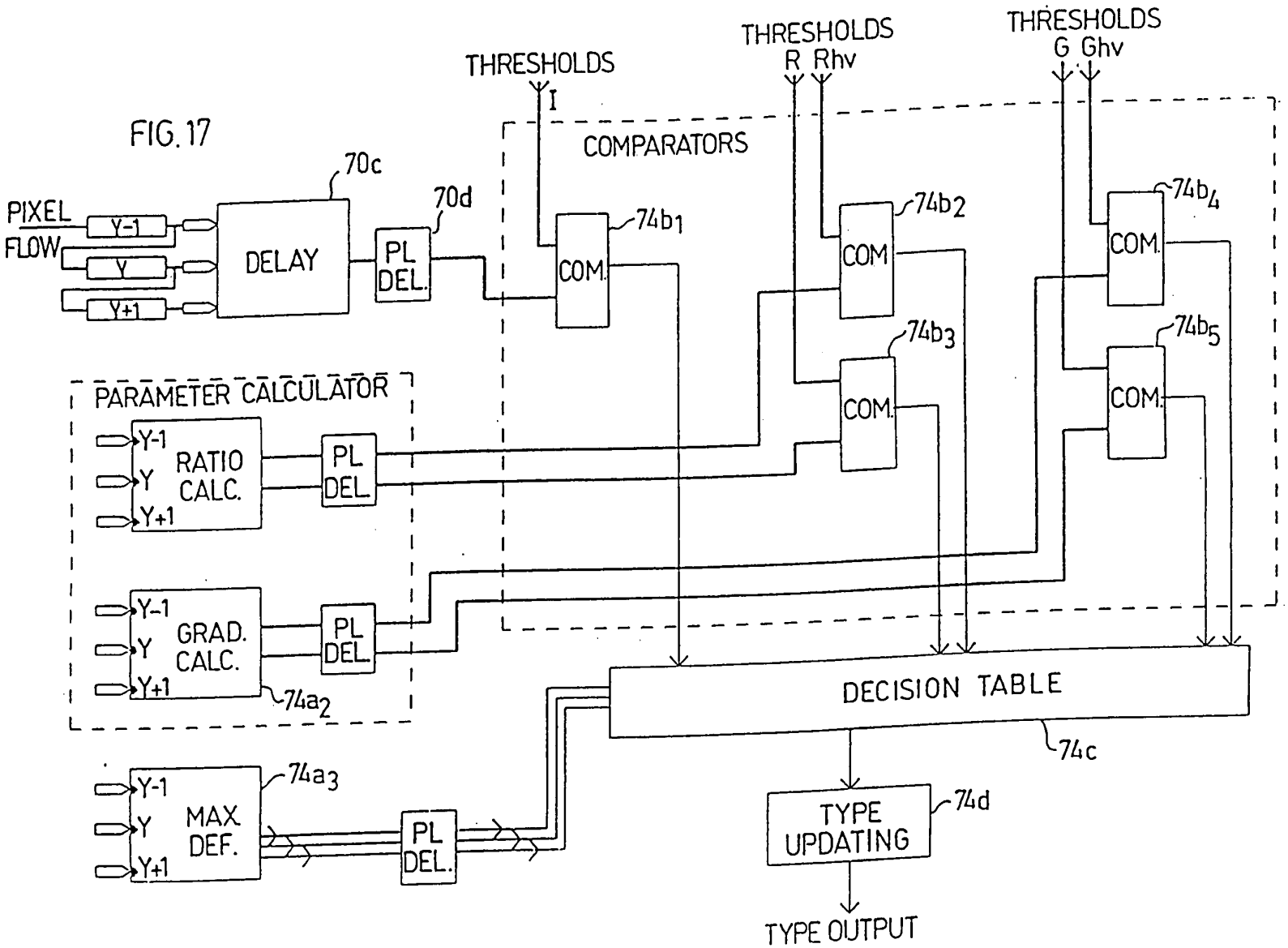


FIG . 16

FIG. 17


THRESHOLDS
I
THRESHOLDS
R Rhv
THRESHOLDS
G Ghv
COMPARATORS
70c
70d
PIXEL
FLOW
Y-1
Y
Y+1
DELAY
PL DEL.
COM.
74b1
74b2
74b3
74b4
74b5
PARAMETER CALCULATOR
RATIO CALC.
GRAD. CALC.
MAX. DEF.
74a2
74a3
DECISION TABLE
74c
TYPE UPDATING
74d
TYPE OUTPUT

TOGTTO"96659260

FIG 17a

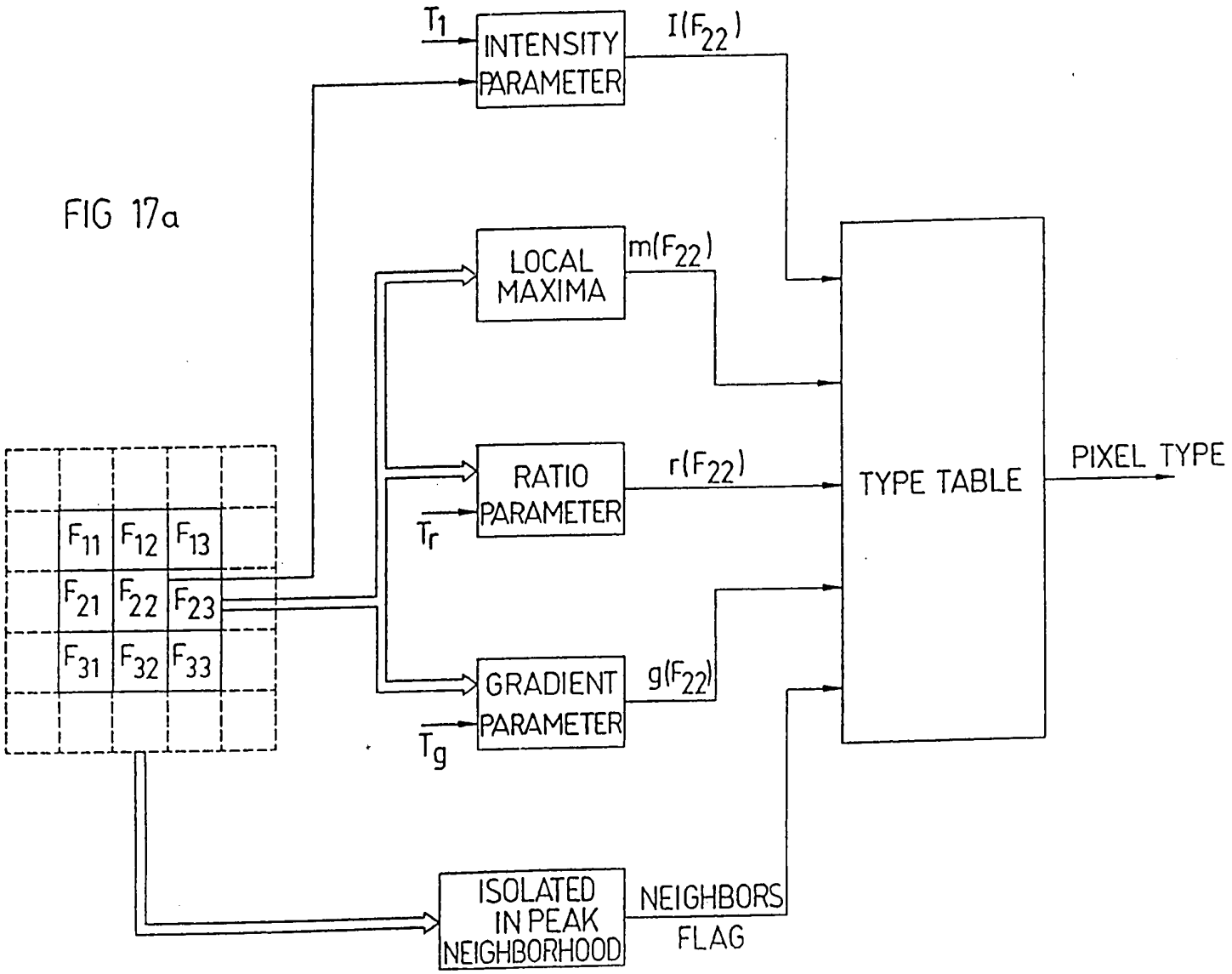
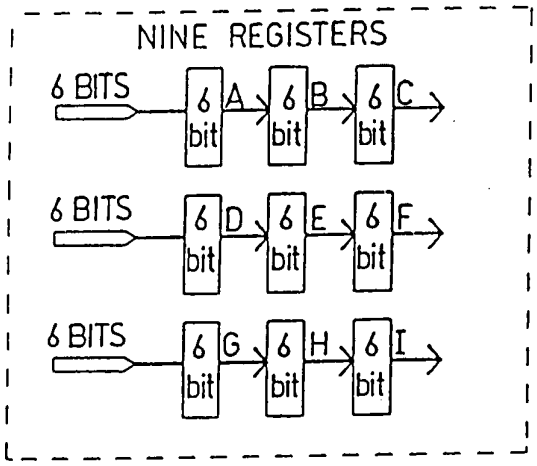


FIG 21a



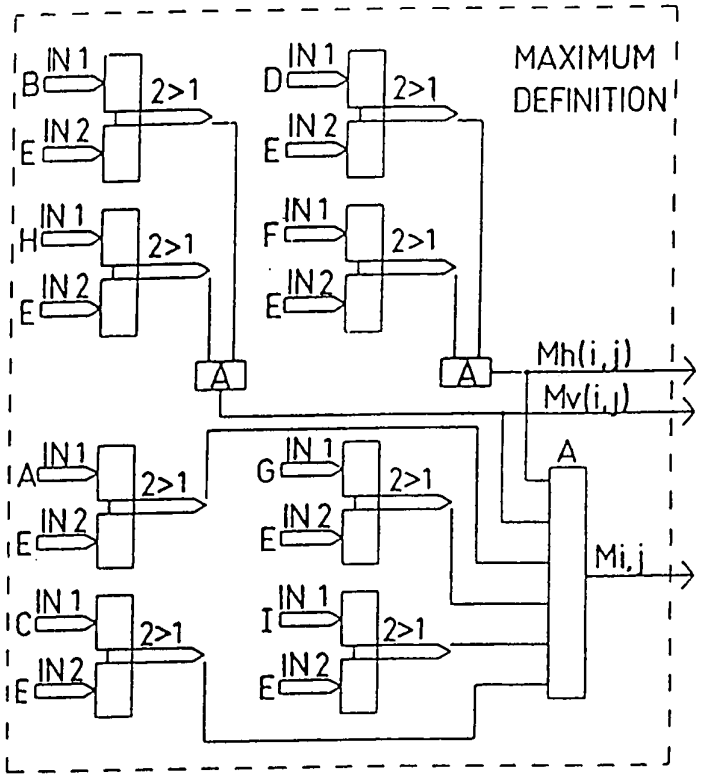
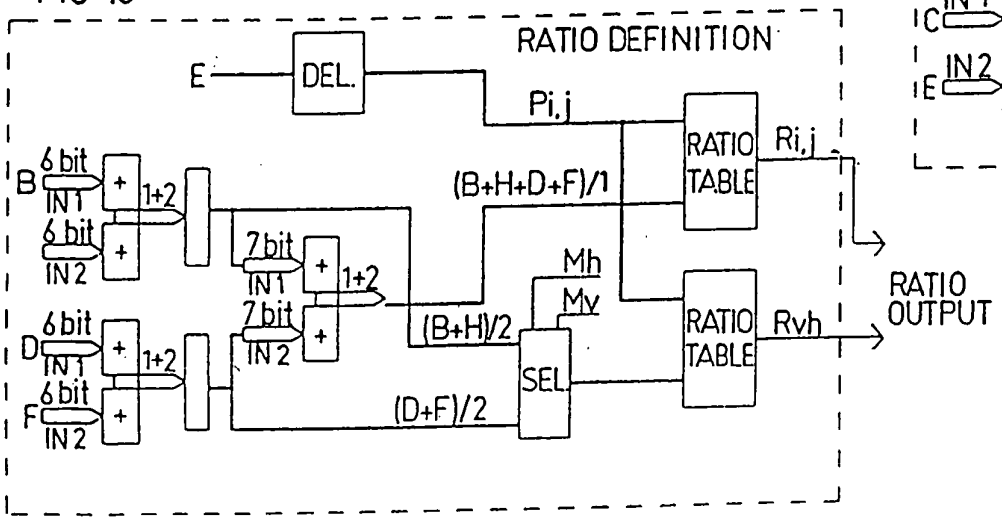


FIG 20

FIG 18



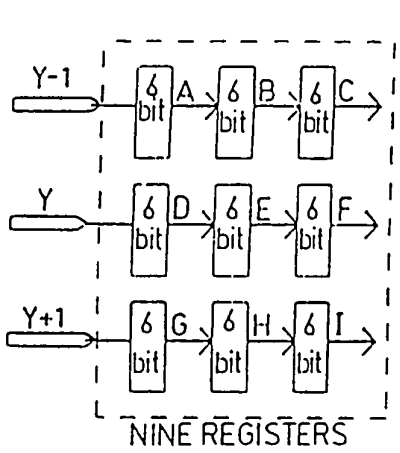
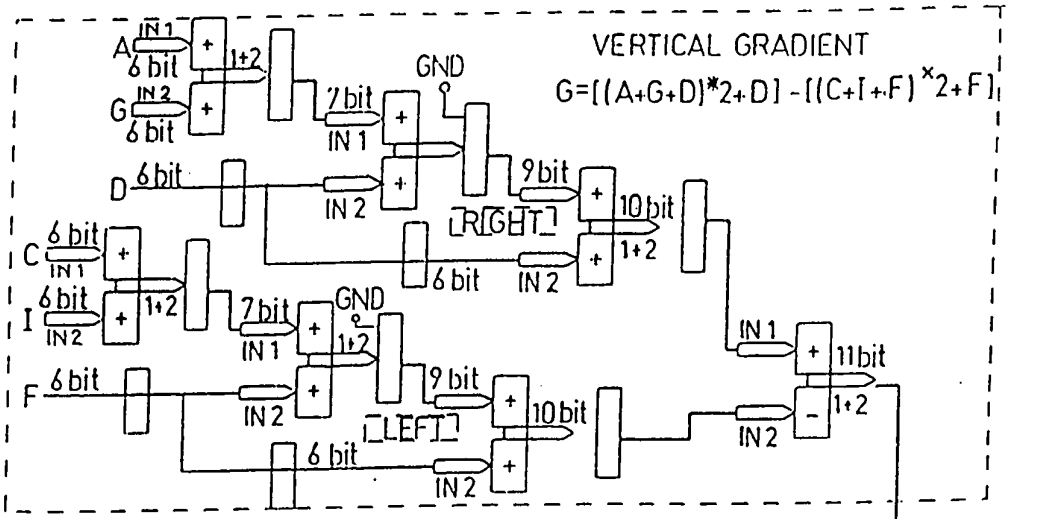
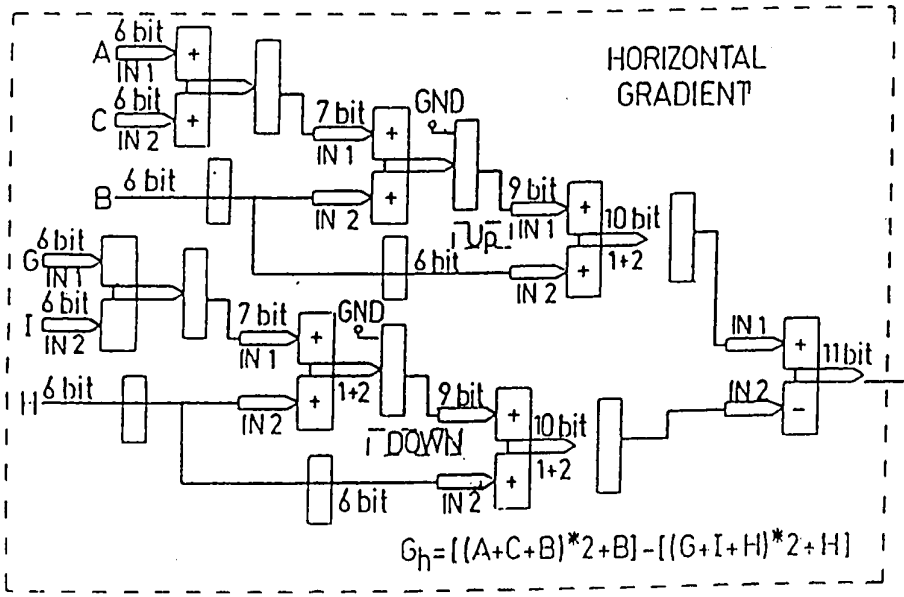
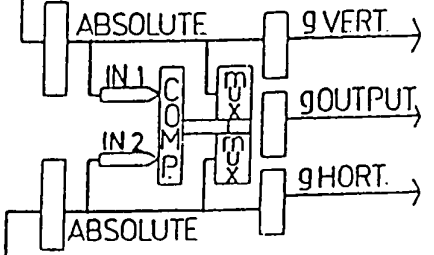


FIG 21b







$g=g_v$ if $g_v>g_h$

or $g=g_h$ if $g_h>g_v$

FIG 19

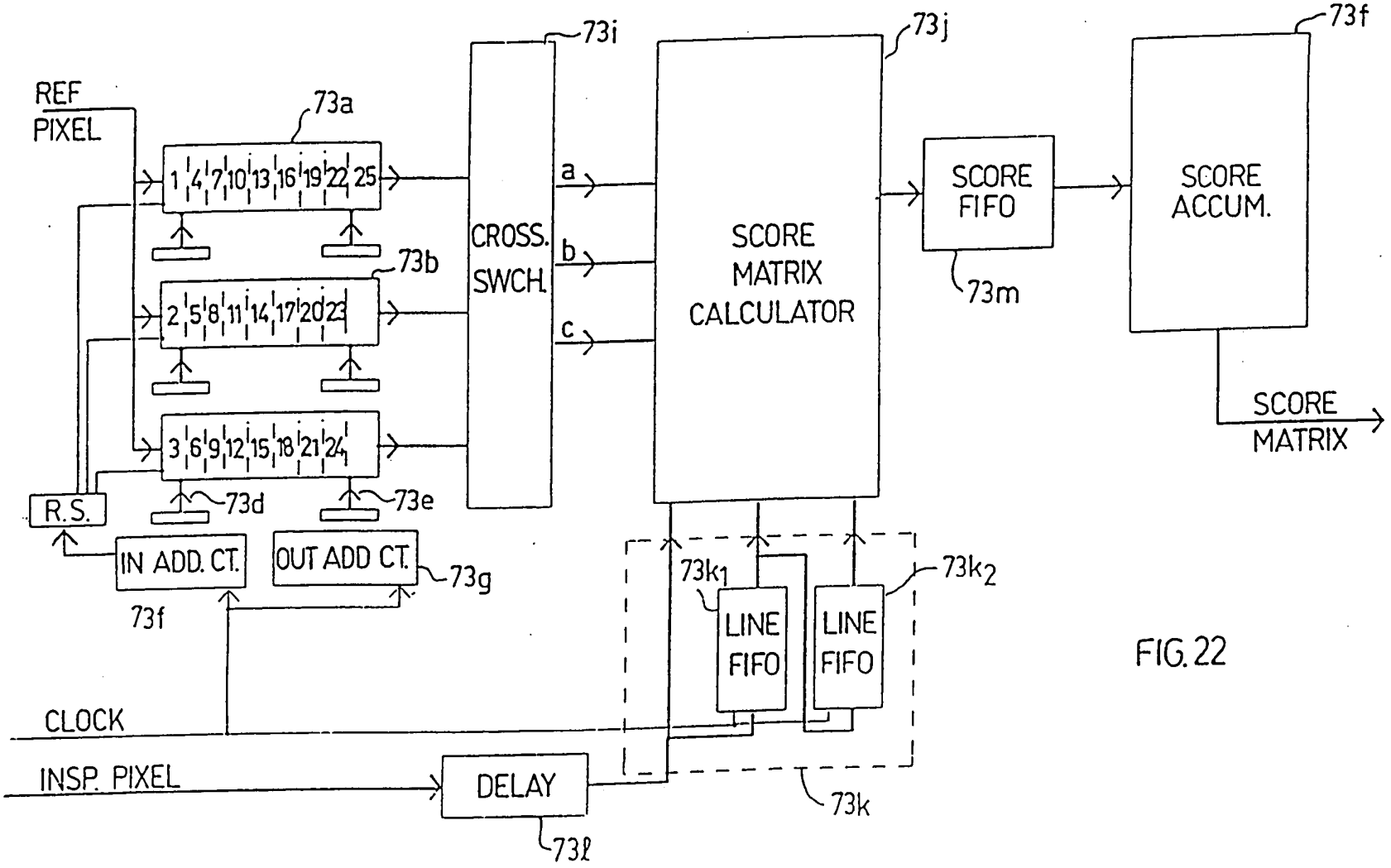

REF PIXEL
73a
1 4 7 10 13 16 19 22 25
73b
2 5 8 11 14 17 20 23
3 6 9 12 15 18 21 24
73d
73e
R.S.
IN ADD. CT.
OUT ADD CT.
73g
73f
CLOCK
INSP. PIXEL
DELAY
73l
CROSS. SWCH.
73i
a
b
c
SCORE MATRIX CALCULATOR
73j
73k1
73k2
LINE FIFO
LINE FIFO
73k
SCORE FIFO
73m
SCORE ACCUM.
73f
SCORE MATRIX

FIG. 22

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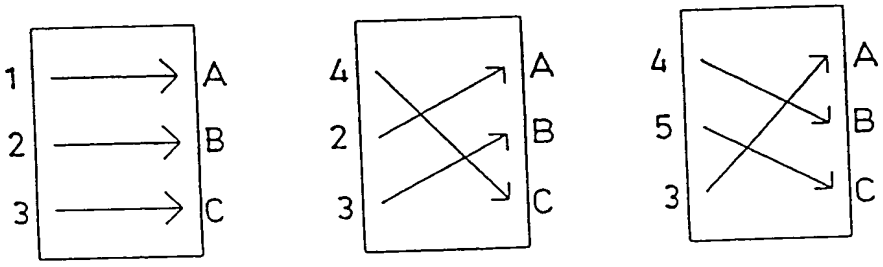

FIG . 22a

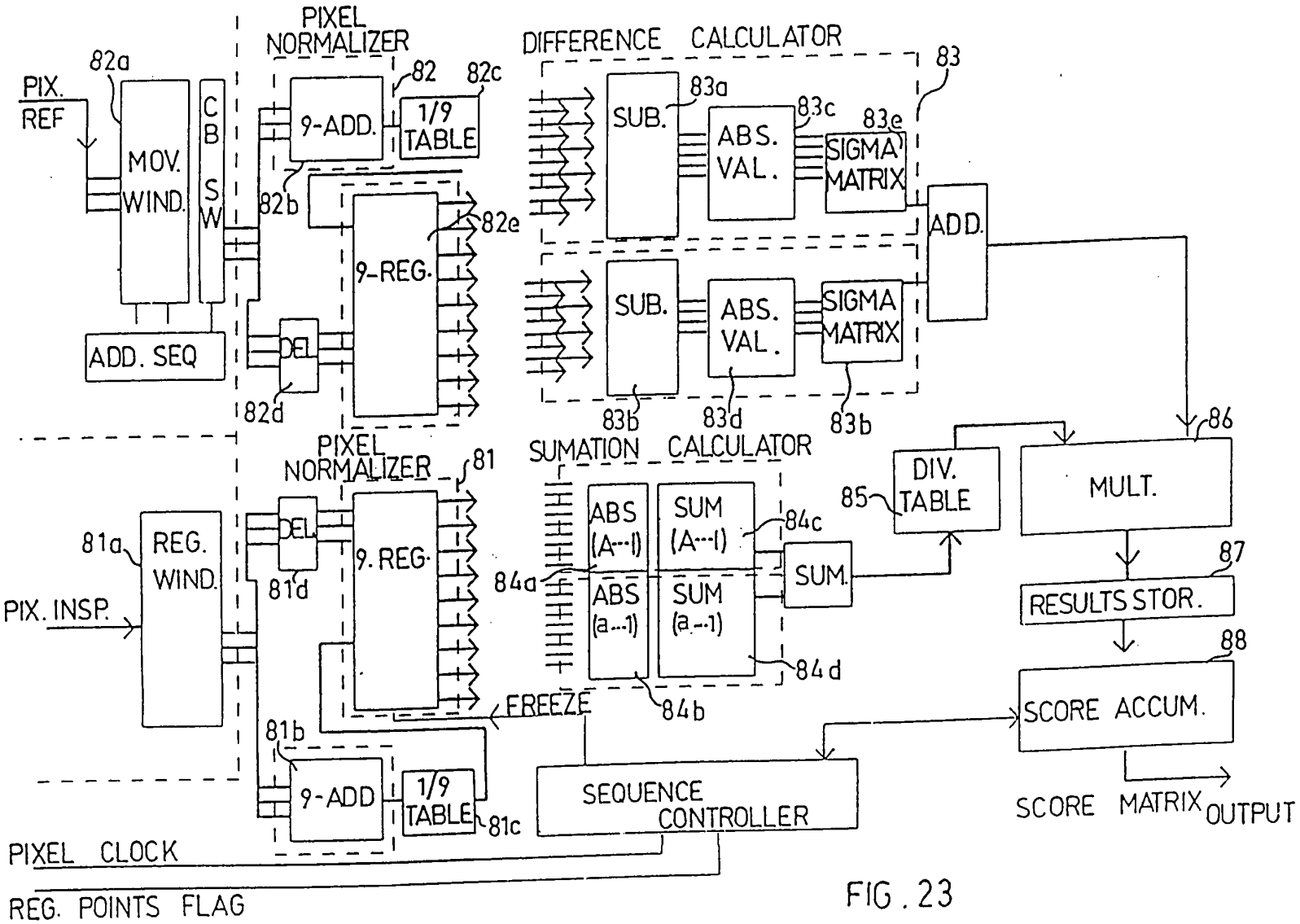
PIXEL NORMALIZER
DIFFERENCE CALCULATOR
PIX. REF
82a
MOV. WIND.
C B S W
9-ADD.
82
82c
1/9 TABLE
82b
9-REG.
82e
ADD. SEQ
DEL
82d
SUB.
83a
ABS. VAL.
83c
SIGMA MATRIX
83e
83
ADD.
SUB.
ABS. VAL.
SIGMA MATRIX
83b
83d
83b
PIXEL NORMALIZER
81
SUMATION CALCULATOR
81a
REG. WIND.
PIX. INSP.
DEL
81d
9. REG.
84a
ABS (A---1)
SUM (A---1)
84c
SUM.
ABS (a---1)
SUM (a---1)
84d
84b
DIV. TABLE
85
MULT.
86
87
RESULTS STOR.
88
SCORE ACCUM.
SCORE MATRIX OUTPUT
FREEZE
81b
9-ADD
1/9 TABLE
81c
SEQUENCE CONTROLLER
PIXEL CLOCK
REG. POINTS FLAG

FIG. 23

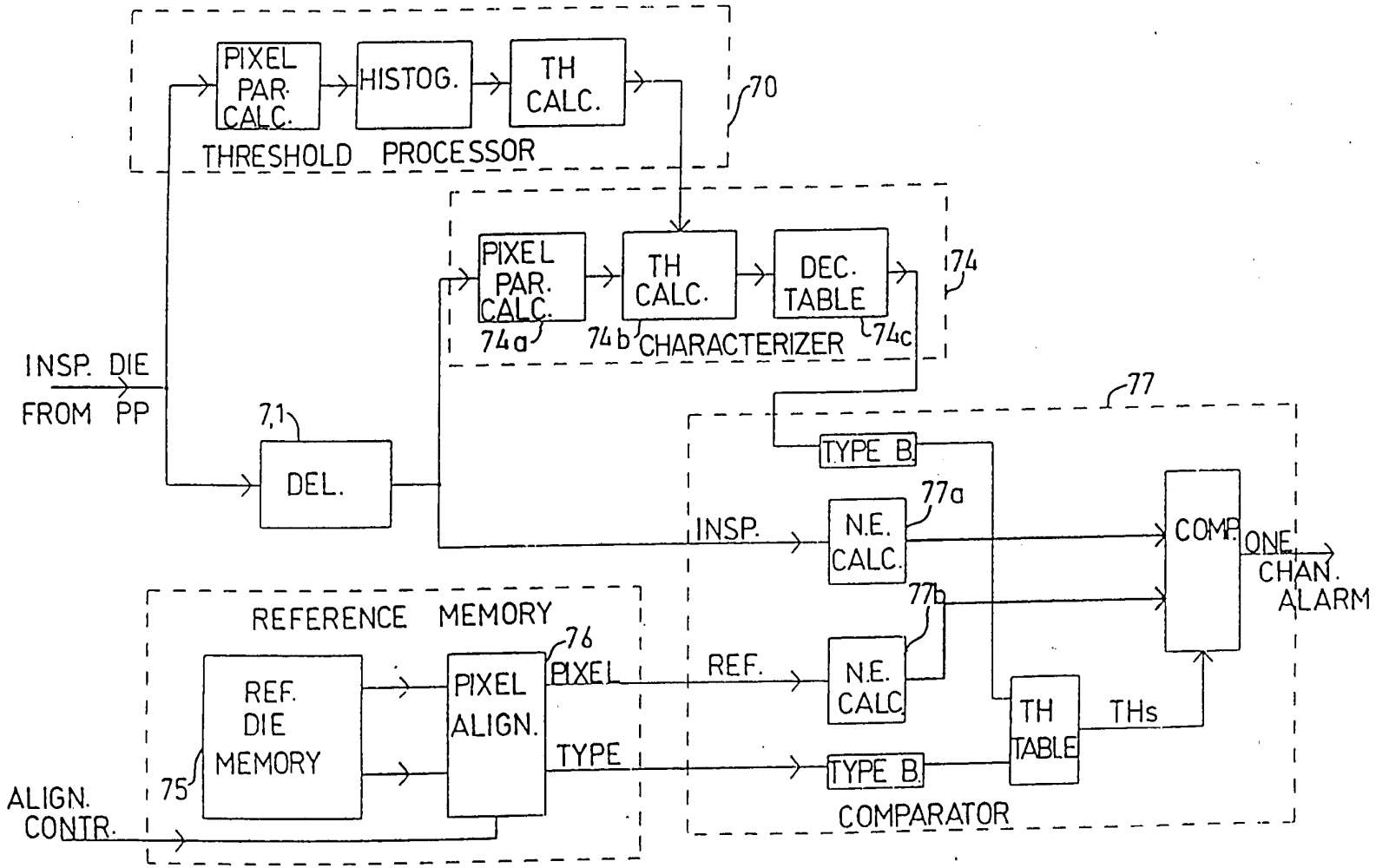
PIXEL PAR. CALC.
HISTOG.
TH CALC.
70
THRESHOLD PROCESSOR
PIXEL PAR. CALC.
TH CALC.
DEC. TABLE
74
74a
74b
CHARACTERIZER
74c
INSP. DIE FROM PP
71
DEL.
77
TYPE B.
INSP.
N.E. CALC.
77a
77b
COMP.
ONE CHAN. ALARM
REFERENCE MEMORY
76
PIXEL
REF. DIE MEMORY
PIXEL ALIGN.
REF.
N.E. CALC.
TH TABLE
THs
TYPE
TYPE B.
75
ALIGN. CONTR.
COMPARATOR

FIG. 24

T06TT0"96659760

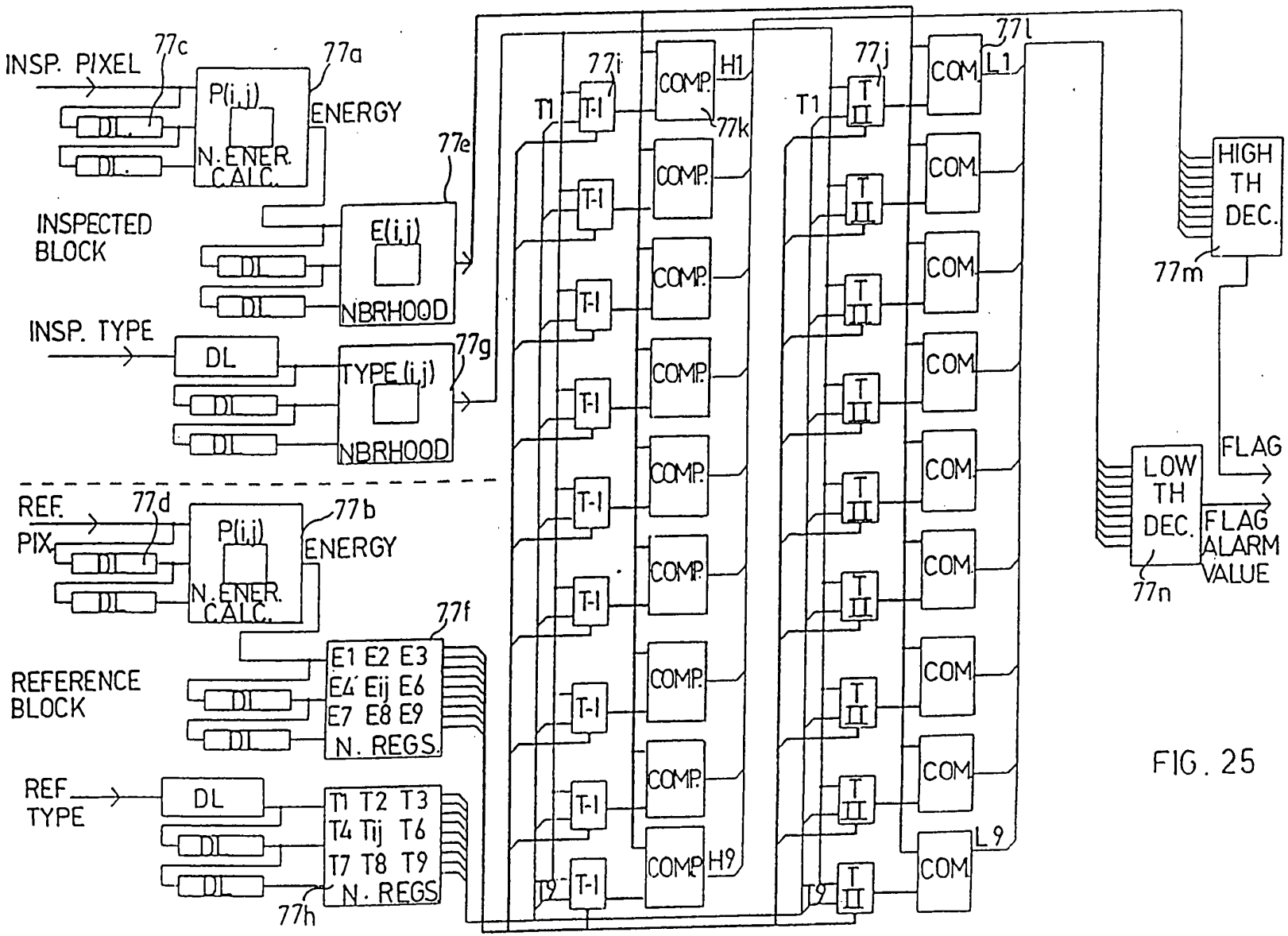

FIG. 25

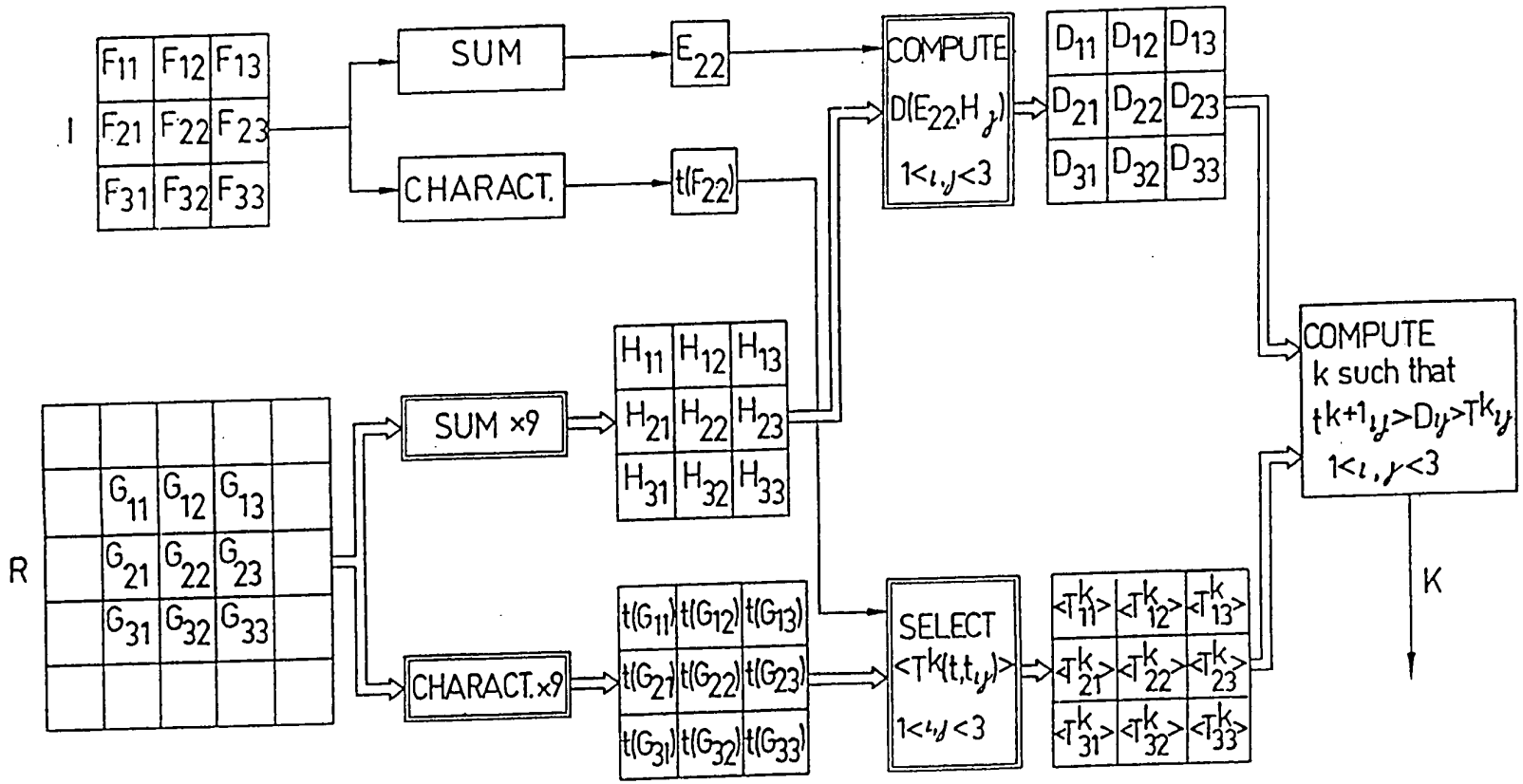
I
F11 F12 F13
F21 F22 F23
F31 F32 F33
SUM
E22
CHARACT.
t(F22)
COMPUTE
D(E22,Hij)
1<i,j<3
D11 D12 D13
D21 D22 D23
D31 D32 D33
R
SUM ×9
H11 H12 H13
H21 H22 H23
H31 H32 H33
CHARACT.×9
t(G11) t(G12) t(G13)
t(G21) t(G22) t(G23)
t(G31) t(G32) t(G33)
SELECT
<Tk(t,tij)>
1<i,j<3
COMPUTE
k such that
tk+1ij>Dij>Tkij
1<i,j<3
K

FIG 25a

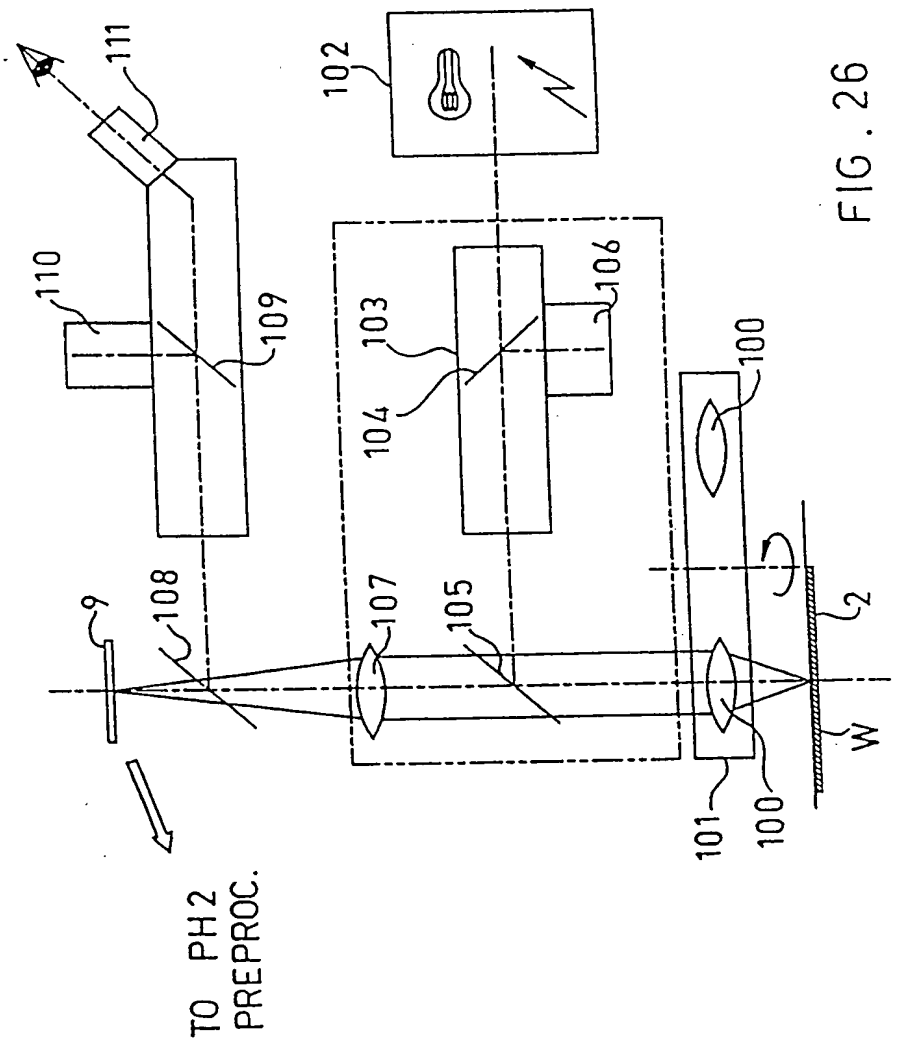
111
102
110
109
103
106
104
100
9
108
107
105
2
W
101
100
TO PH2
PREPROC.

FIG. 26

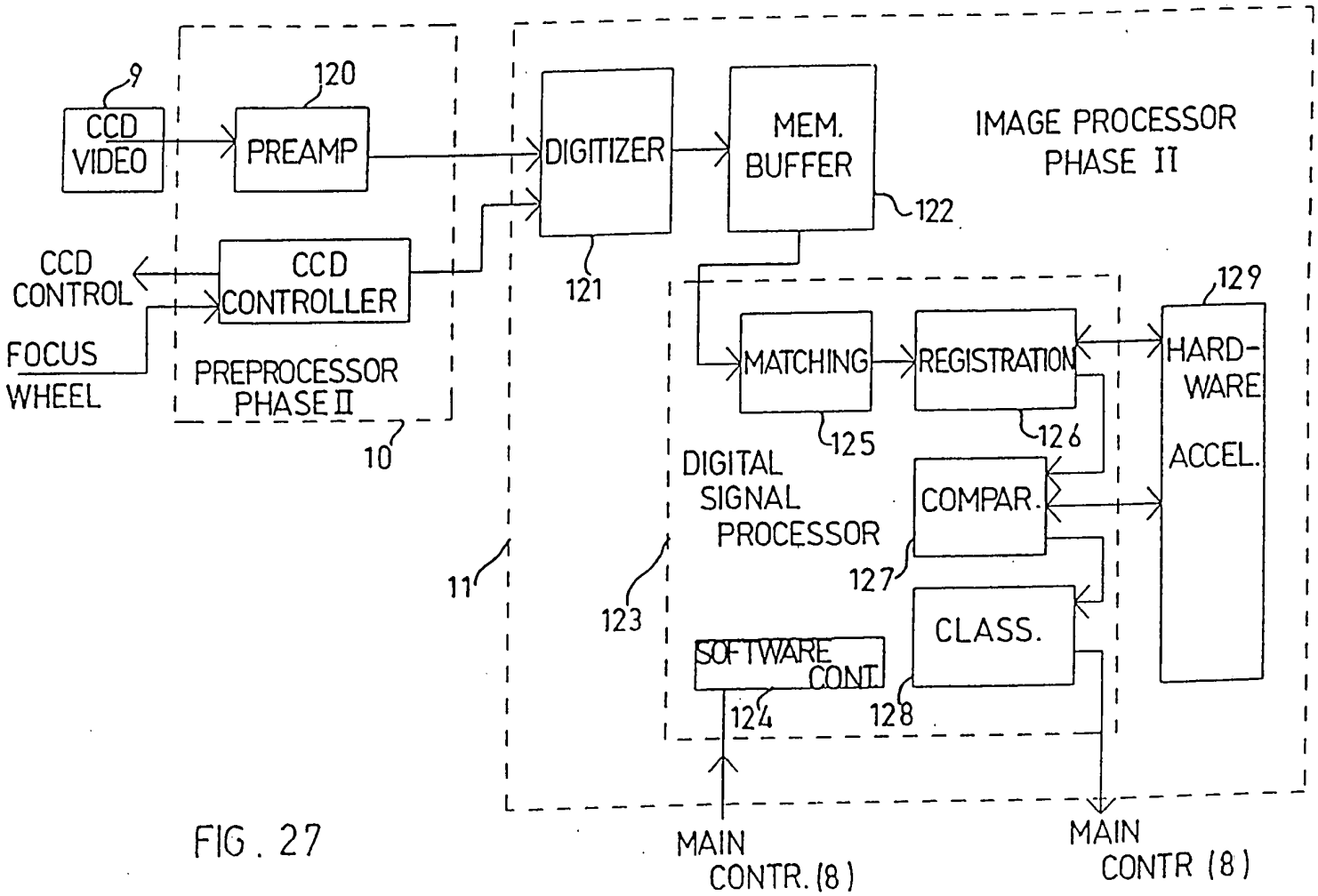
9
CCD VIDEO
120
PREAMP
DIGITIZER
MEM. BUFFER
IMAGE PROCESSOR PHASE II
122
CCD CONTROL
CCD CONTROLLER
121
FOCUS WHEEL
PREPROCESSOR PHASE II
10
MATCHING
REGISTRATION
129
HARD-WARE
125
126
ACCEL.
DIGITAL SIGNAL PROCESSOR
COMPAR.
11
123
127
CLASS.
SOFTWARE CONT.
124
128
MAIN CONTR. (8)
MAIN CONTR (8)

FIG. 27

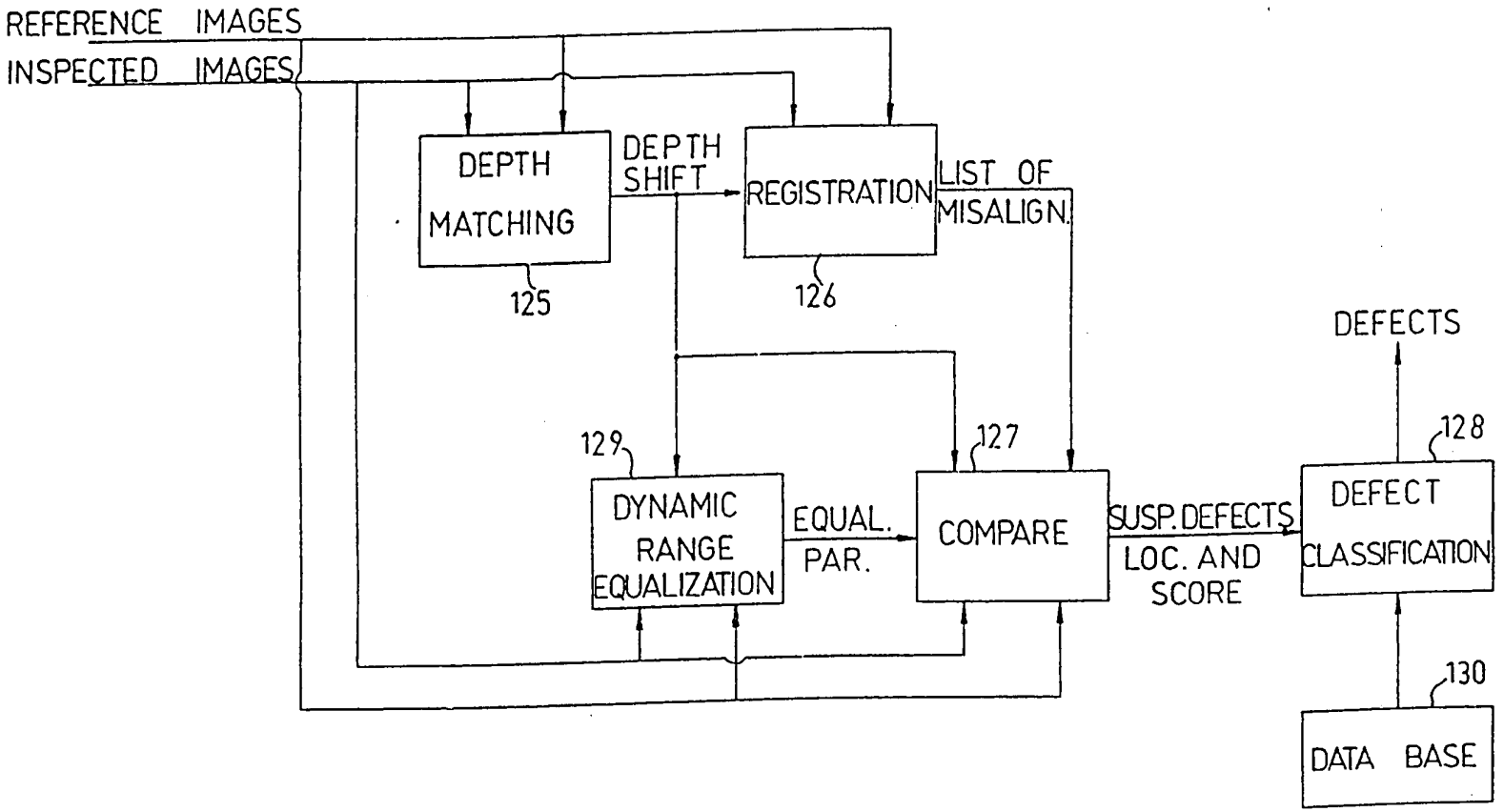
REFERENCE IMAGES
INSPECTED IMAGES
DEPTH MATCHING
125
DEPTH SHIFT
REGISTRATION
126
LIST OF MISALIGN.
DEFECTS
128
129
127
DYNAMIC RANGE EQUALIZATION
EQUAL. PAR.
COMPARE
SUSP. DEFECTS LOC. AND SCORE
DEFECT CLASSIFICATION
130
DATA BASE

FIG. 28

0976505 - 01-1901

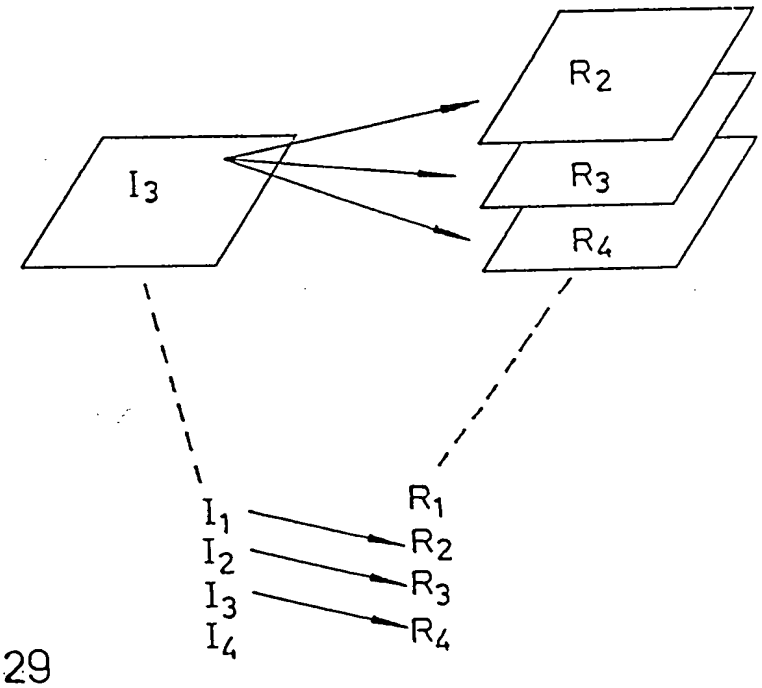

FIG. 29

TOSTTO" 96659760

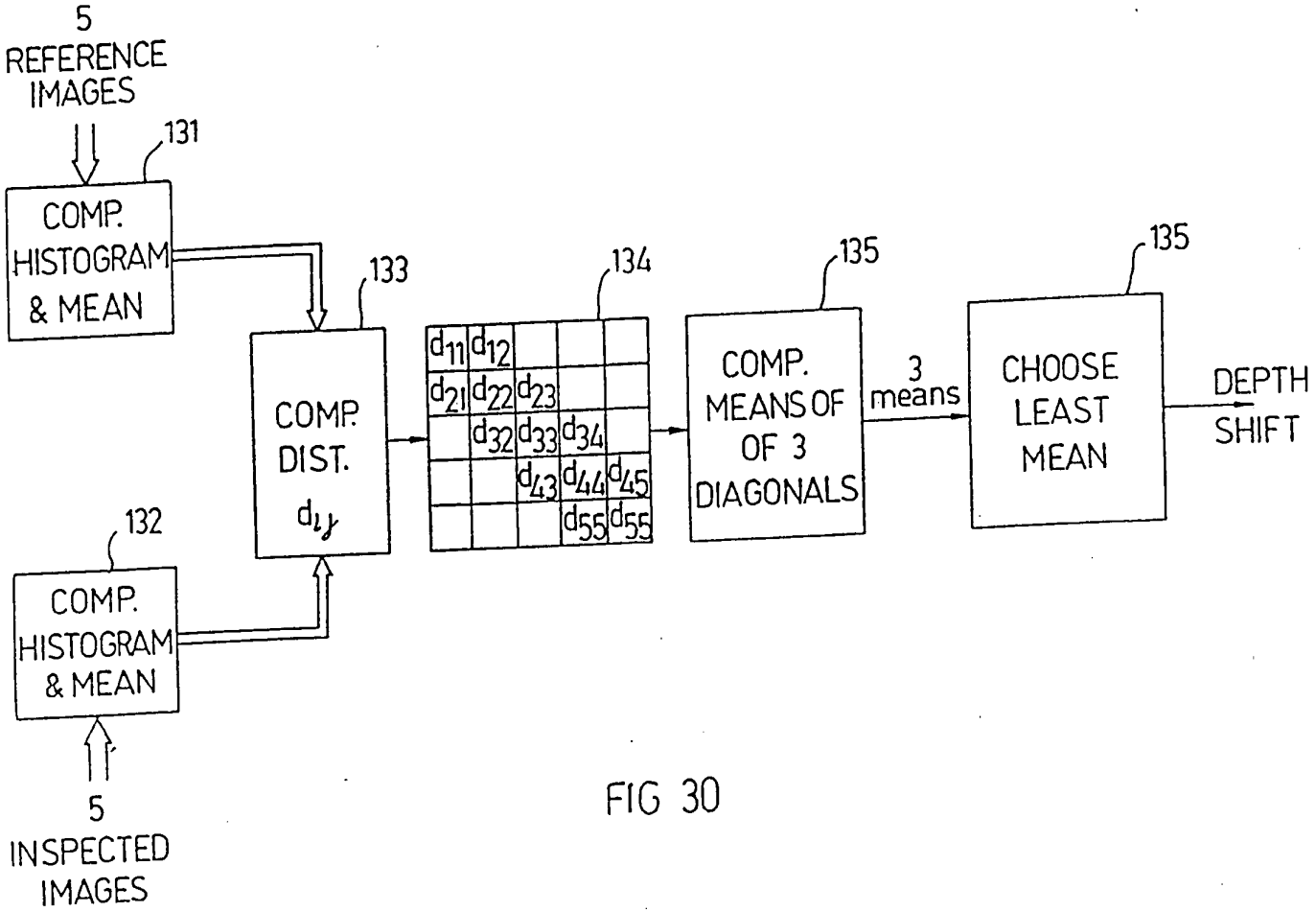

FIG 30

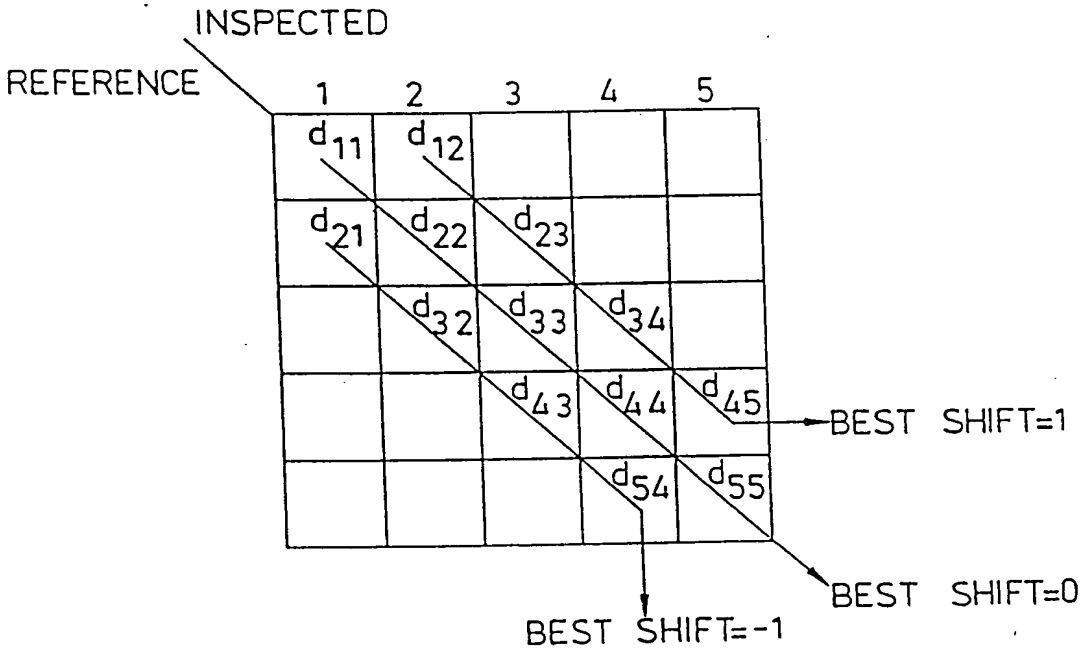

FIG . 31

0,965,965 .01/19/01

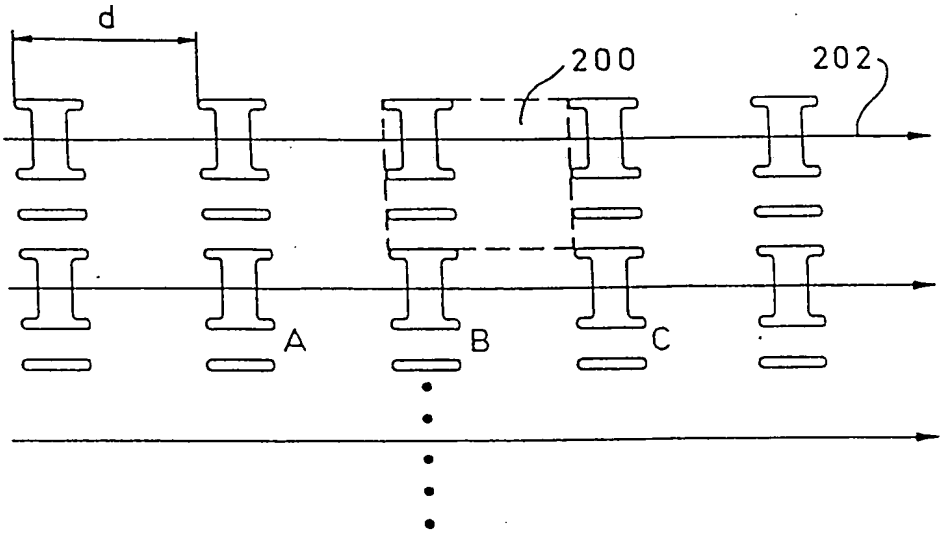

FIG. 32

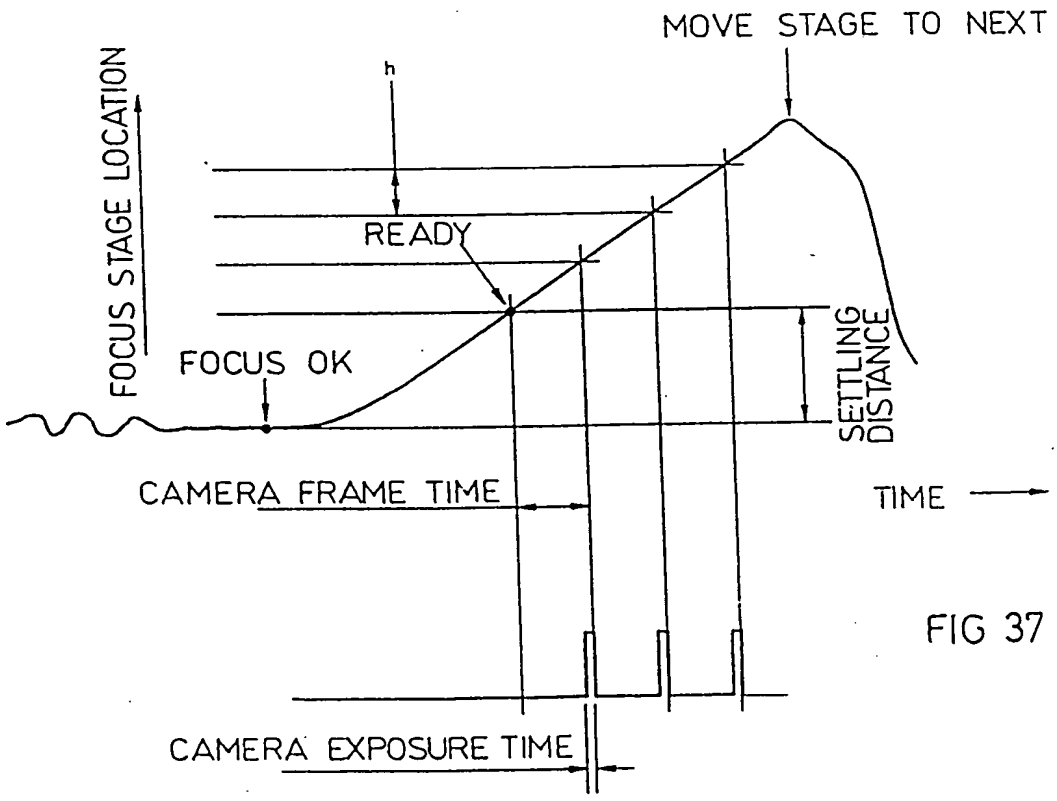

FIG 37

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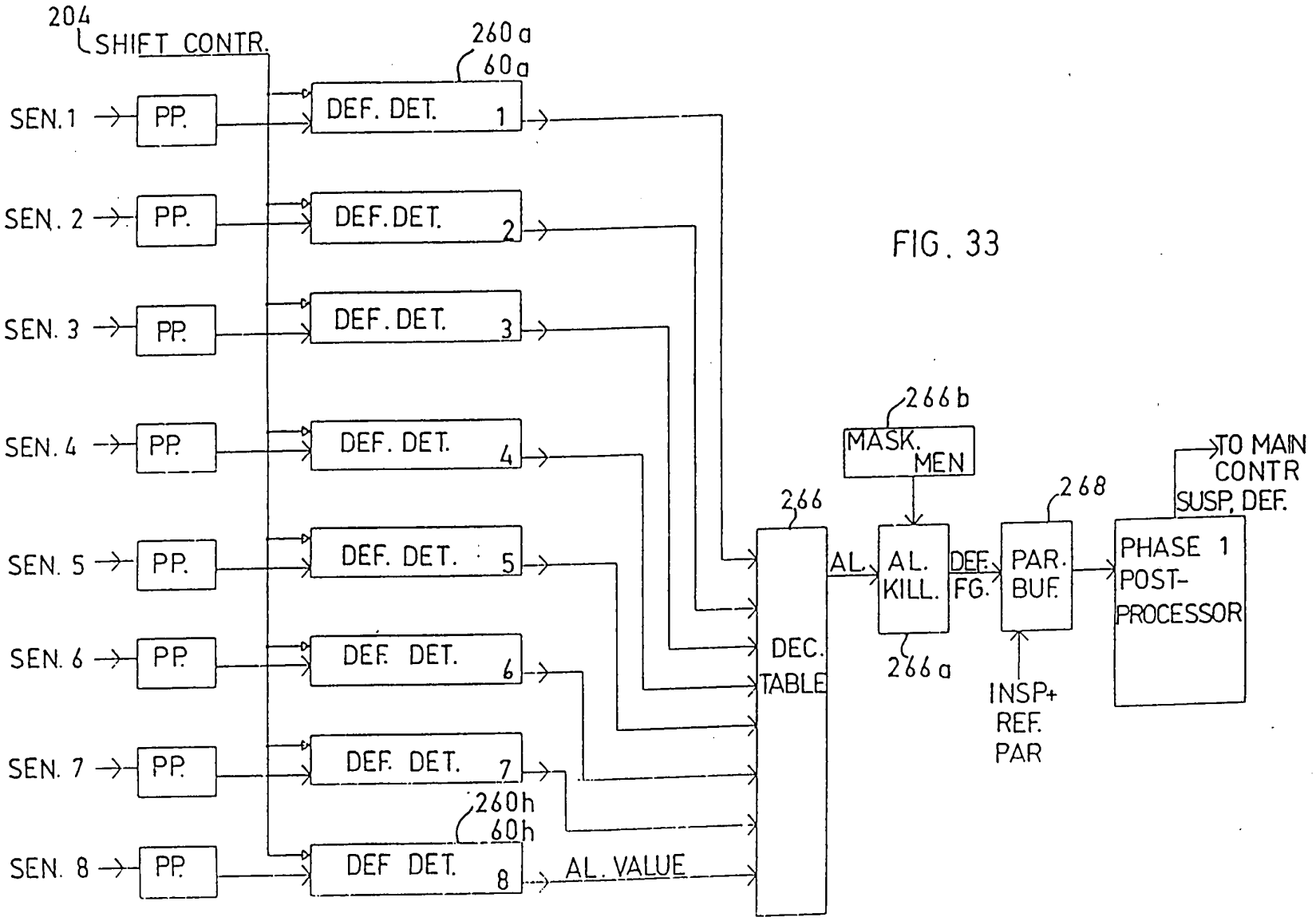
204
SHIFT CONTR.
260a
60a
SEN. 1
PP.
DEF. DET. 1
SEN. 2
PP.
DEF. DET. 2
SEN. 3
PP.
DEF. DET. 3
SEN. 4
PP.
DEF. DET. 4
SEN. 5
PP.
DEF. DET. 5
SEN. 6
PP.
DEF. DET. 6
SEN. 7
PP.
DEF. DET. 7
260h
60h
SEN. 8
PP.
DEF DET. 8
AL. VALUE
266
DEC. TABLE
266b
MASK. MEN
AL.
AL. KILL.
266a
DEF. FG.
268
PAR. BUF.
INSP+ REF. PAR
PHASE 1 POST-PROCESSOR
TO MAIN CONTR
SUSP. DEF.

FIG. 33

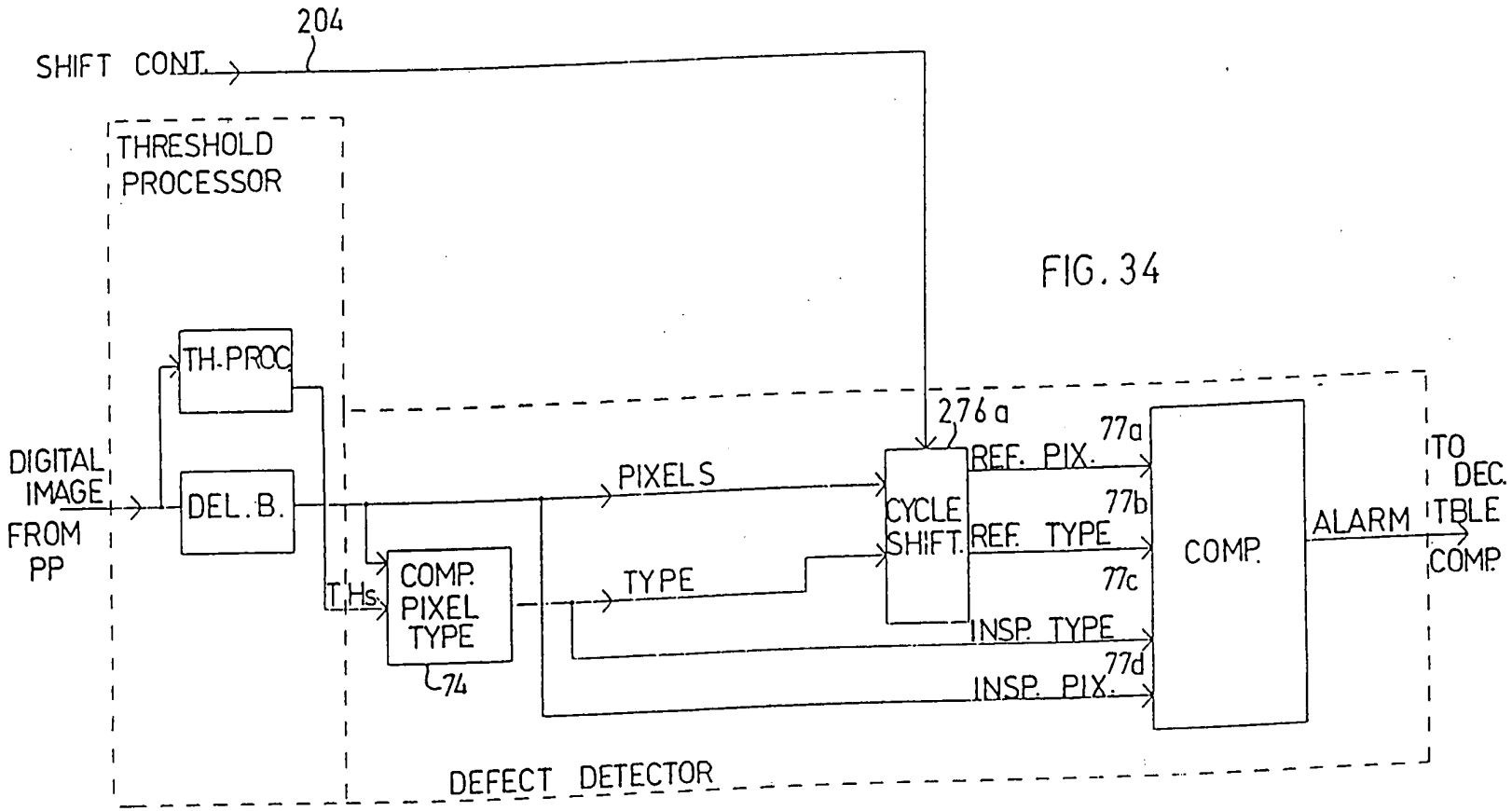
204
SHIFT CONT.
THRESHOLD PROCESSOR
TH.PROC
DIGITAL IMAGE FROM PP
DEL.B.
T Hs
COMP. PIXEL TYPE
74
PIXELS
TYPE
276a
CYCLE SHIFT.
77a
REF. PIX.
77b
REF. TYPE
77c
INSP. TYPE
77d
INSP. PIX.
COMP.
ALARM
TO DEC. TBLE COMP.
DEFECT DETECTOR

FIG. 34

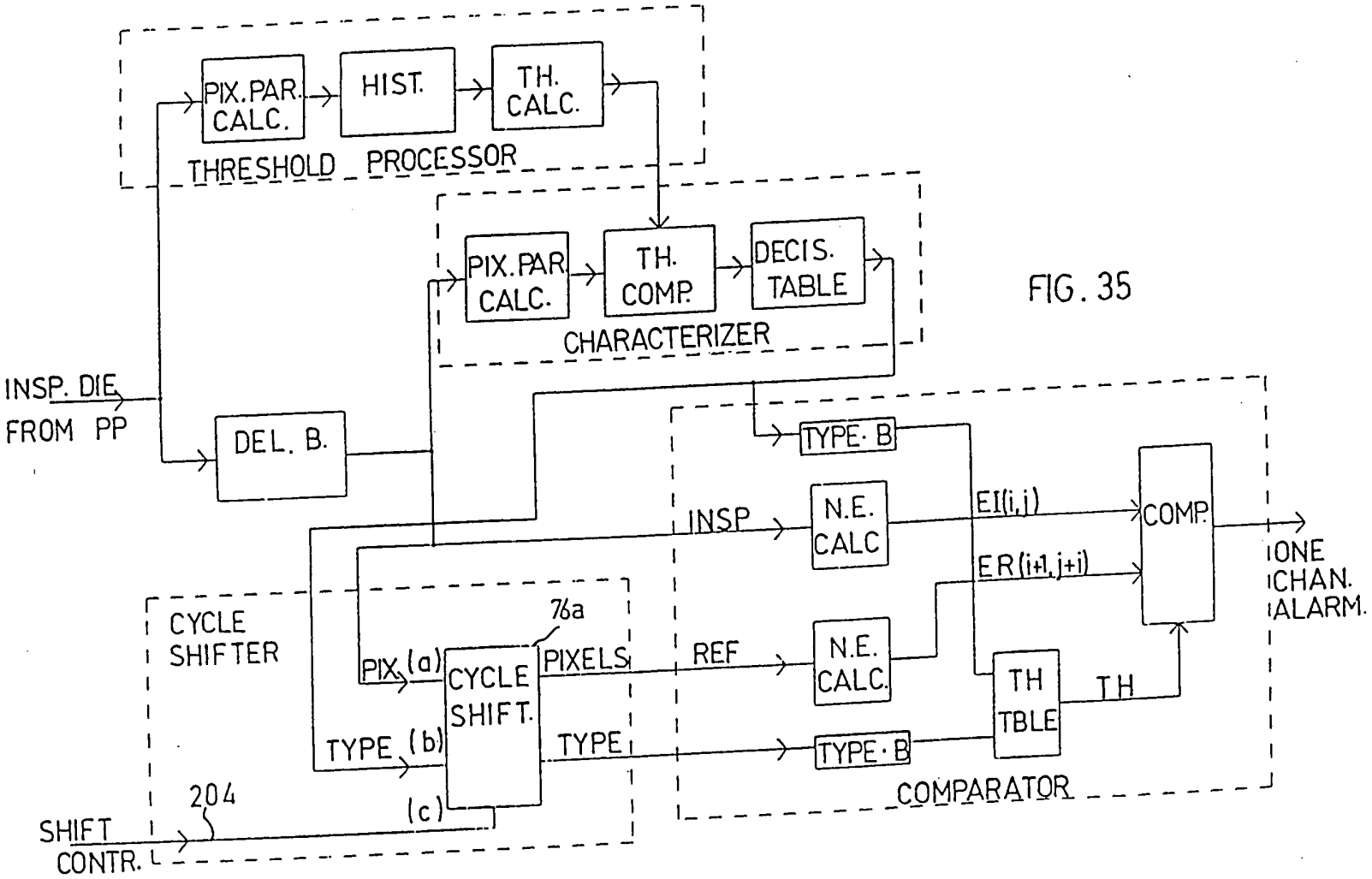
PIX. PAR. CALC.
HIST.
TH. CALC.
THRESHOLD PROCESSOR
PIX. PAR CALC.
TH. COMP.
DECIS. TABLE
CHARACTERIZER
INSP. DIE FROM PP
DEL. B.
TYPE· B
INSP
N.E. CALC
EI(i,j)
COMP.
ONE CHAN. ALARM.
ER(i+1,j+i)
CYCLE SHIFTER
76a
PIX (a)
CYCLE SHIFT.
PIXELS
REF
N.E. CALC.
TH TBLE
TH
TYPE (b)
TYPE
TYPE· B
204
(c)
SHIFT CONTR.
COMPARATOR

FIG. 35

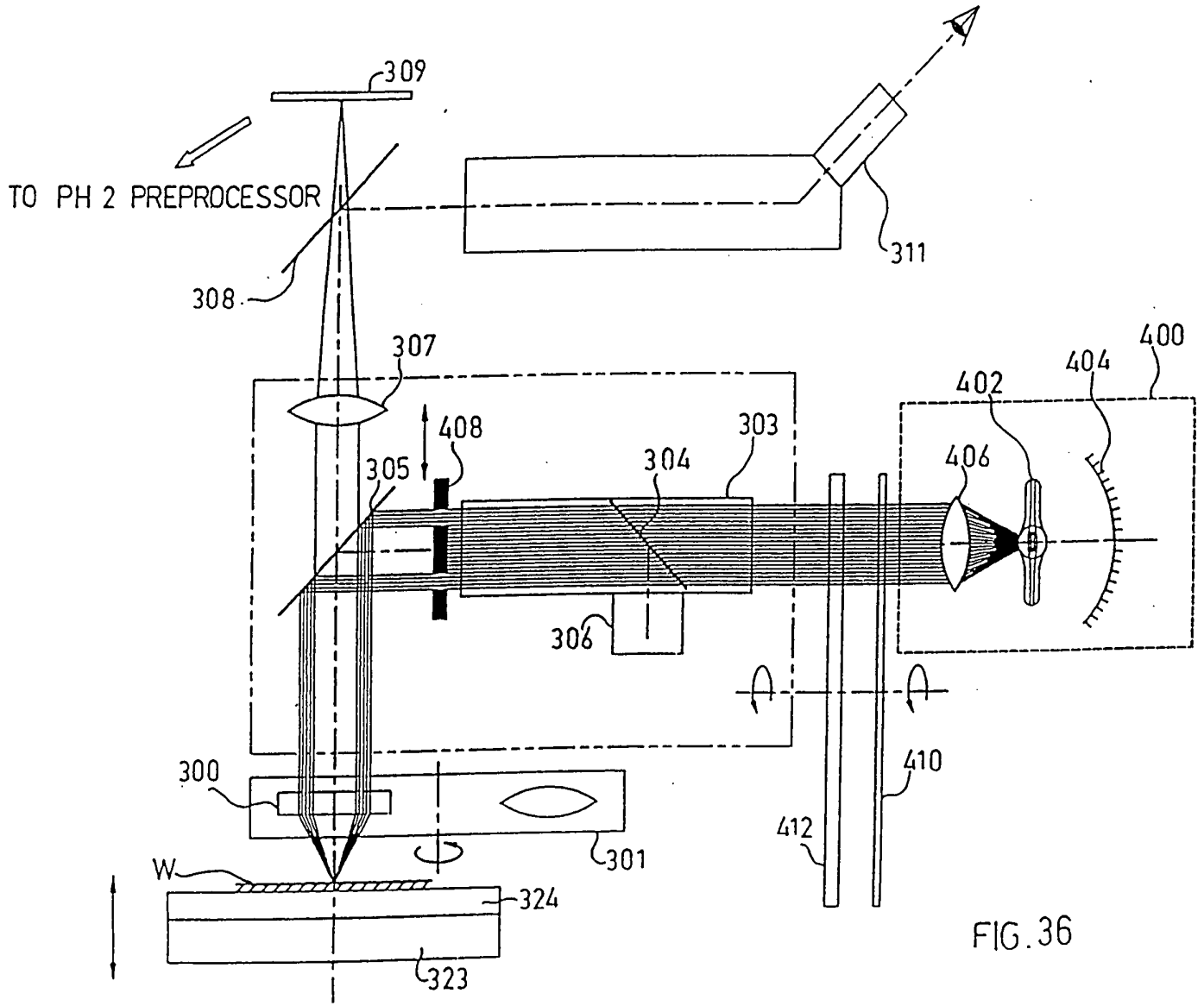
309
TO PH 2 PREPROCESSOR
311
308
307
400
404
402
408
303
304
305
406
306
410
412
300
301
W
324
323

FIG. 36

Patent - 5,586,058

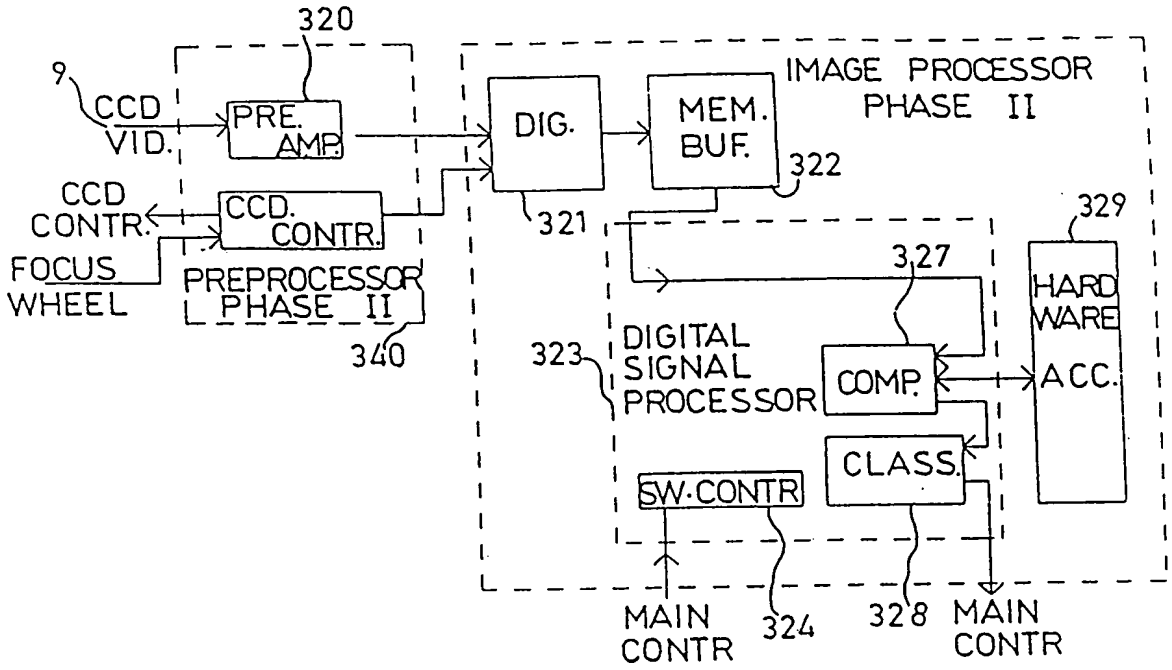

FIG . 38

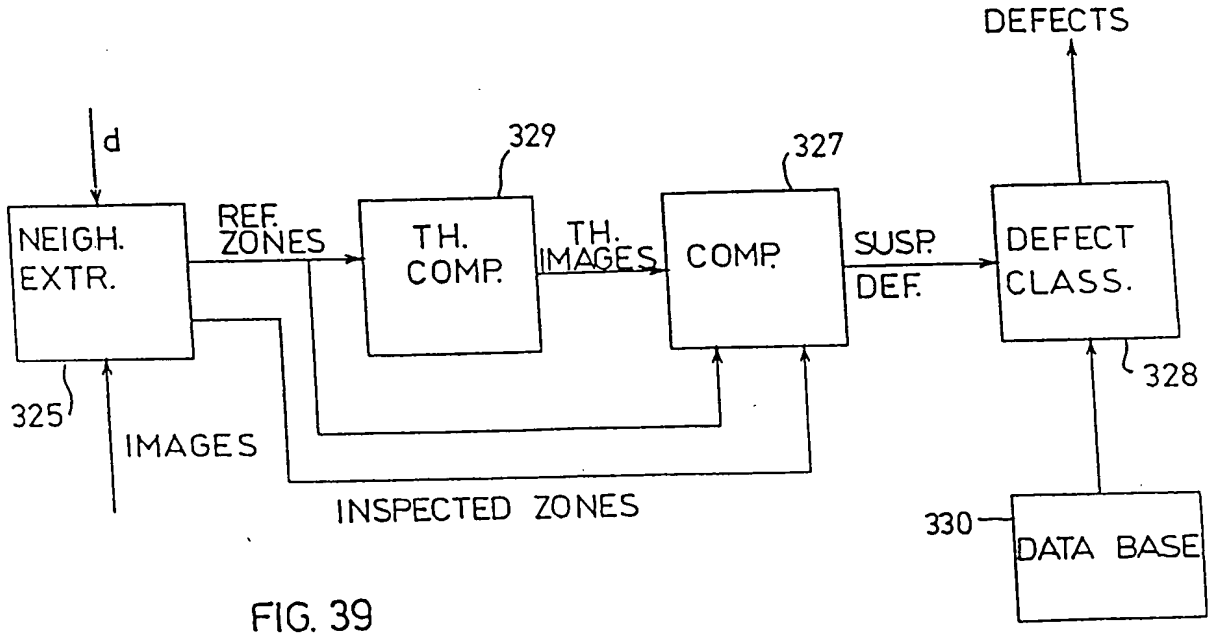

FIG. 39

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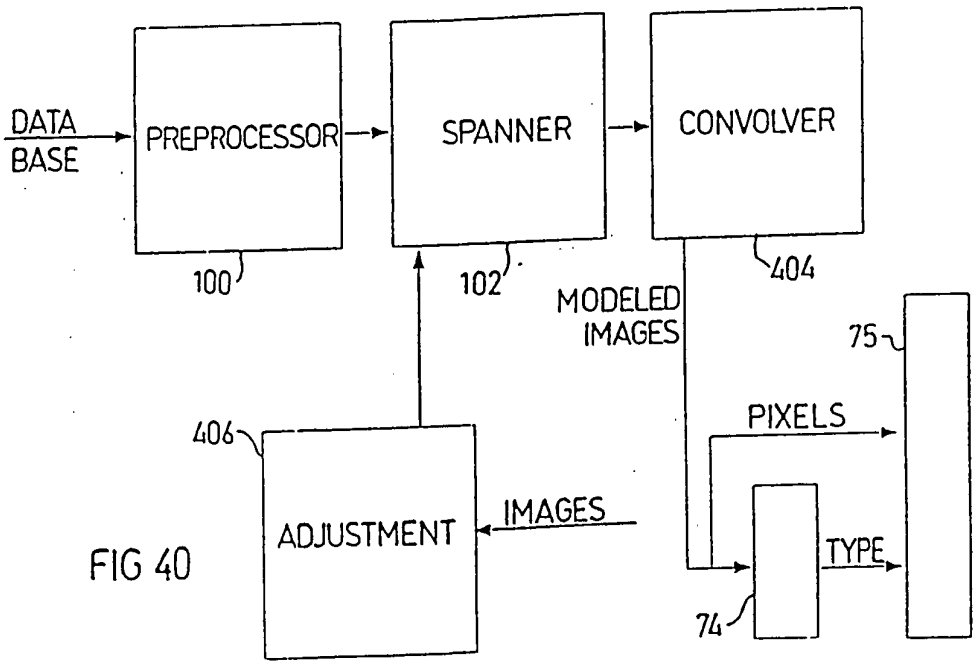

FIG 40

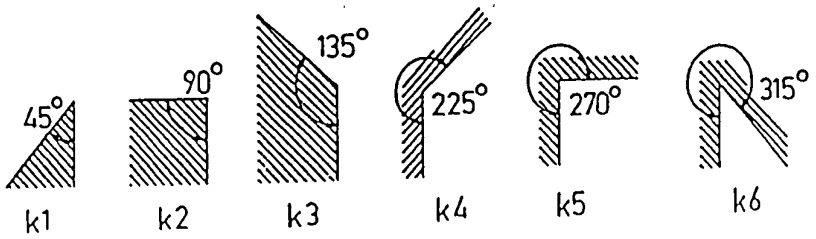

FIG. 41

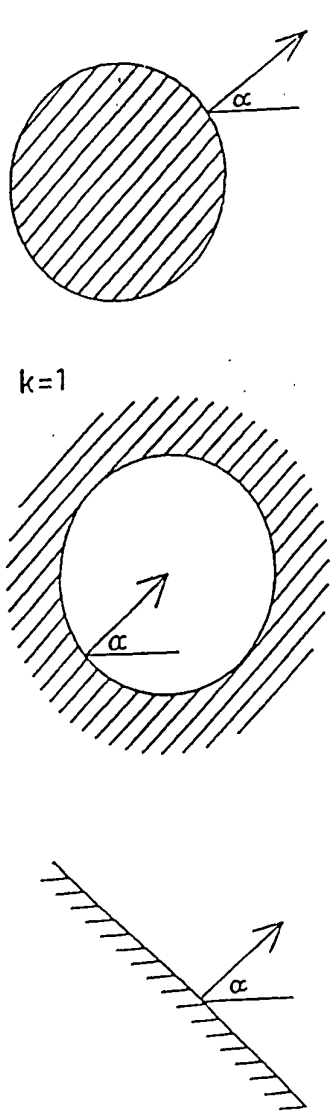

FIG 42

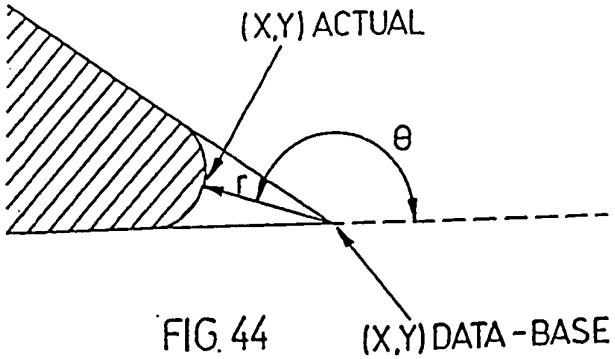

FIG. 44

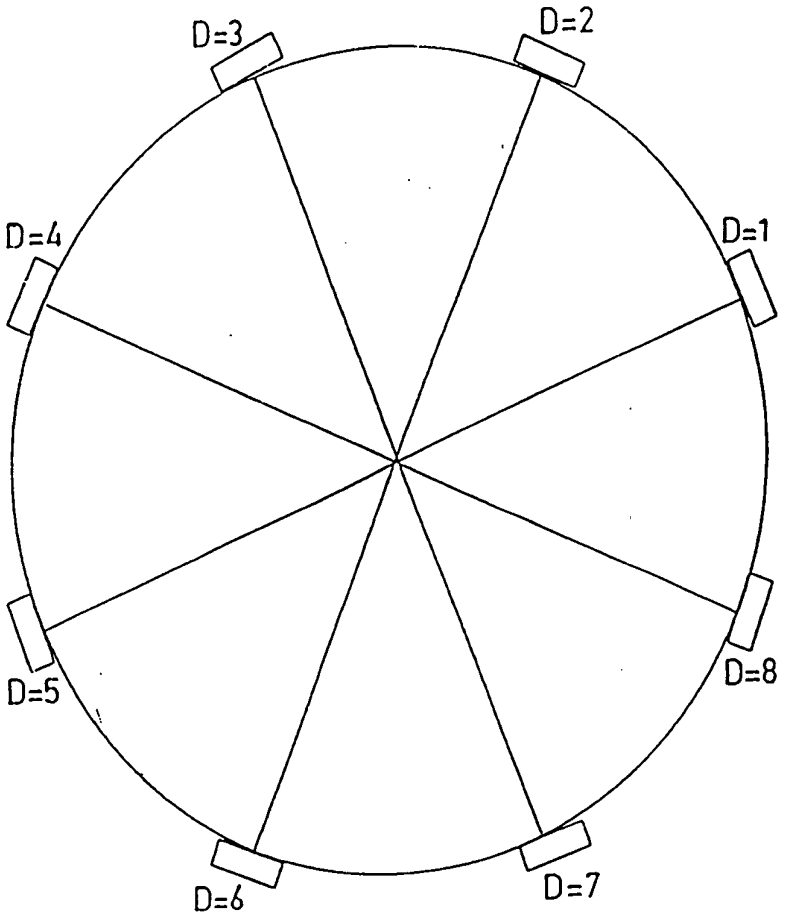

FIG 43

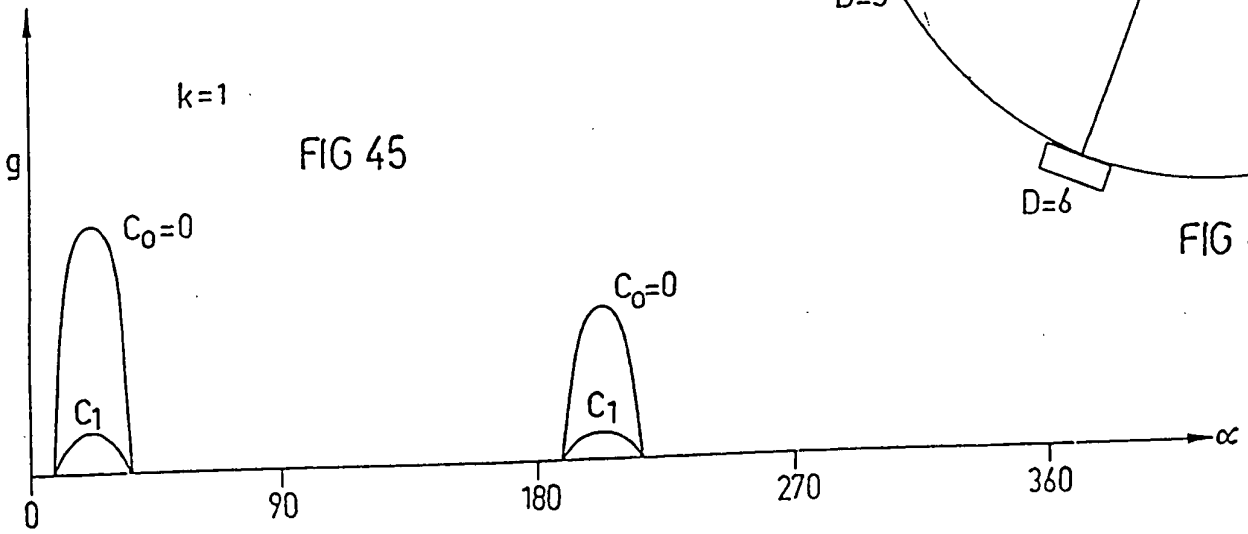

FIG 45

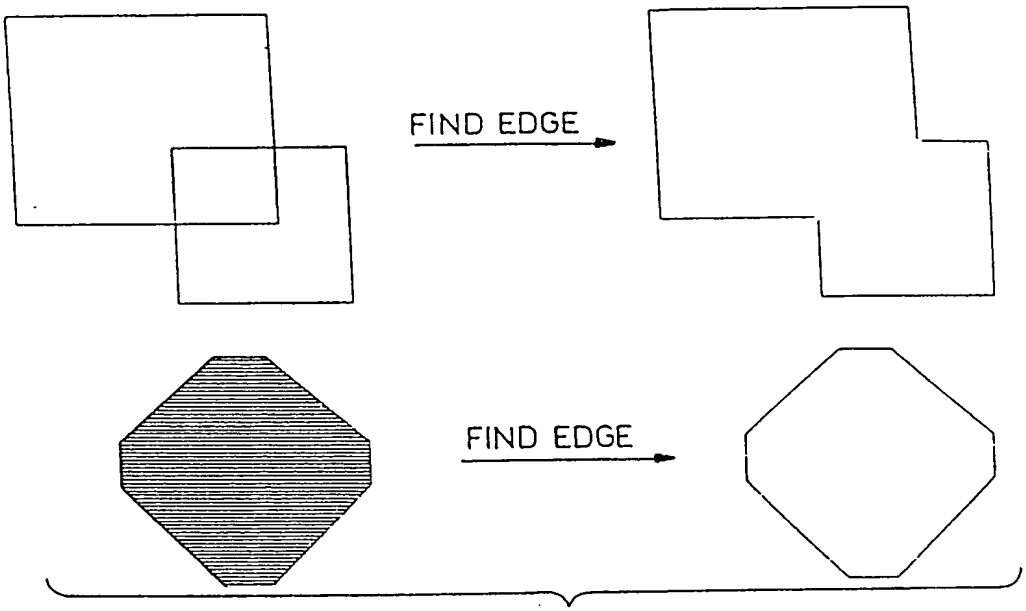

FIG 46

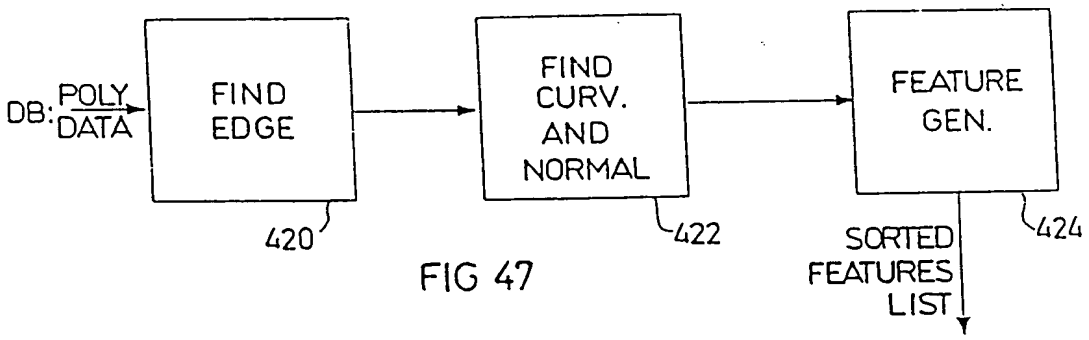

FIG 47

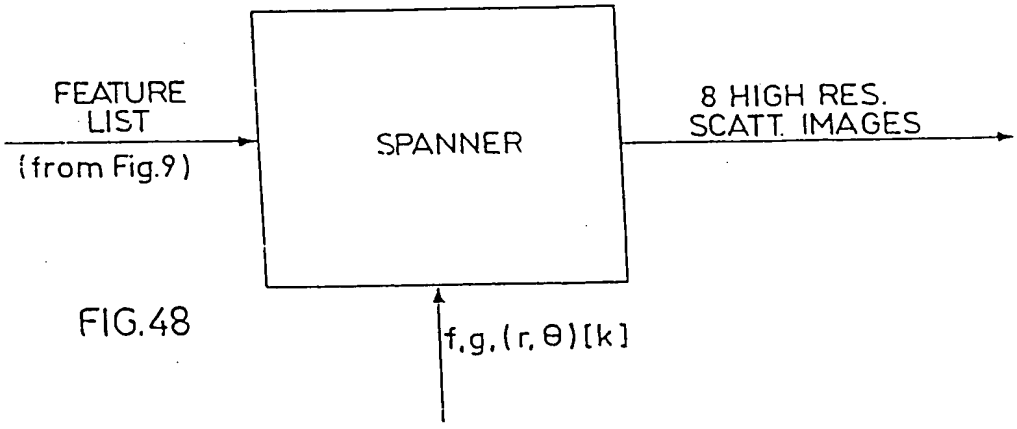

FIG.48

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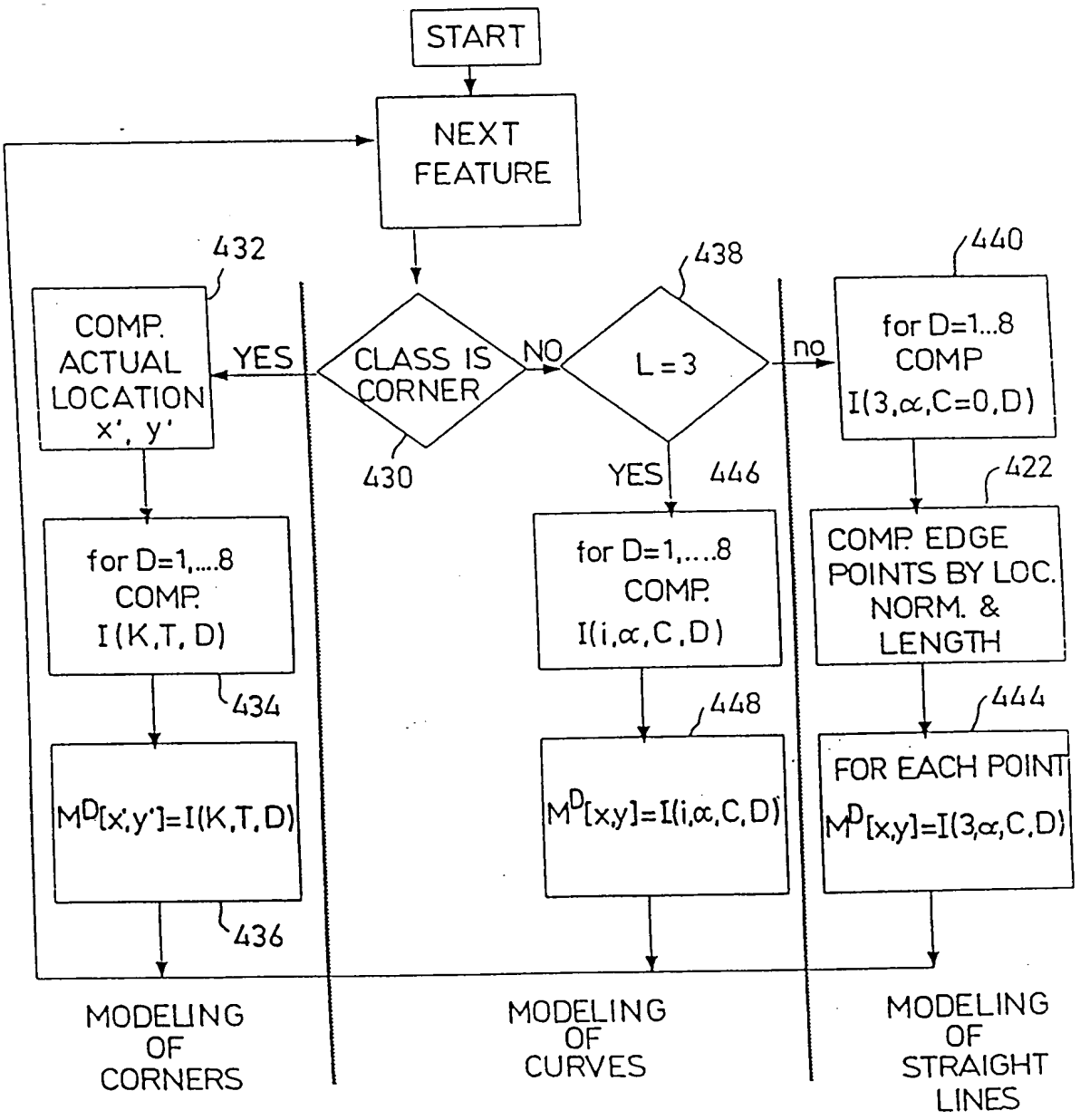

FIG 49